MAY, 1949

SPE Journal

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SPE Journal

Published monthly except July and August by the Society of Plastics Engineers, Inc.

ISSUED MONTHLY TO ALL MEMBERS OF THE SOCIETY OF PLASTICS ENGINEERS

Volume 5 **Number 5**

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Athens, Ohio

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The Cover —

The cover and name on last month's magazine were liked and appreciated by most members, and your editor wishes they could be kept. But it seems we got our tail caught in the copyright screen door—someone else already owns the name we chose. So for the moment we are without a title, but next issue ought to see us all set.

Professional —

The applications which have been sent out to every member seem to have caused confusion in some quarters. The purpose is simple: members change jobs and addresses, and the national office needs complete and up to date information for each member. Further, because of added experience in plastics, many engineers are ready to be advanced in degree of membership, and this gives us a chance to upgrade the junior classes who have accumulated the requirements since their first application was made out. Further, for the new grade of membership, the Professional grade member, we must have the pertinent information, to be passed on first by the local credentials committees, then by the national credentials committee. Filling out this application only means that you are giving the national office up to date information, and that you may be upgraded in membership rank. It does **not** mean that any new or additional fees or dues are to be paid, and in no case will it result in a down-grading of membership.

Prize —

Have you submitted your entry in the 1949 SPE Prize Paper Contest, or are you still working on it? The awarding of the first prize is one of the highest awards that SPE can make, and the winning of any of the prizes marks the author as a man of outstanding and original ability. Your paper may deal with any aspect of the plastics business, and must be

(Please turn to page 2)

PRIZE—

under 5000 words, exclusive of drawings or graphs, and must be submitted to the president of your local SPE section, or if you are not a member of SPE, to the National Office in Athens, Ohio, before November of this year. Many local sections are also offering worthwhile prizes. Your paper may deal with chemistry, engineering, selling, applications, or of practical shop tricks or procedure; thermoplastics, thermosetting materials, extrusion, molding, laminating, the making of films, adhesives, and so on. **You** know more about **your** job than anybody else. Write it up. Now.

MAKE AN OFFER—

Gentlemen:

In checking our present stock of material, we find that we have a surplus in the following items. We would appreciate your bringing them to the attention of your readers.

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These materials are being offered at cost in an effort to reduce our present inventory.

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(Signed) Gus F. Ingwersen, President; Ingwersen Mfg. Co., 1800 S. Acoma St., Denver 10, Colorado.

P.S. We would appreciate an offer from any party interested in an effort to clear this material from our books.

E.C.P.D. REPORTS—

The Engineer's Council for Professional Development has recently issued its 16th annual report. This 40 page publication lists the accredited undergraduate engineering colleges, and the means and criteria for their accreditation. It also includes reports on Professional Training, Professional Recognition, and on Engineering Ethics, a canon of ethics for engineers, and other reports.

"The Most Desirable Personal Characteristics" is the title of another of their publications, 25 pages in length, the purpose of which is stated—"Certain qualities seem invaluable in associates and in the personnel of factory and office. Suppose that a choice were asked between a reasonable number of such qualities, would there be any discernable pattern of preference among executives, administrators, personnel officers and others? The conviction that such a pattern did exist and that its form would prove interesting and profitable to all groups alike demanded that a survey be made."

These publications are worthy of the close attention of all persons in any field of engineering. More information concerning them may be obtained from F. J. Van Antwerpen, Engineers' Council for Professional Development, 29 West 39th St., New York 18, New York.

Klippings from Kozy

By WALTER KOZY

Chemical Engineer, Lyon, Inc.

As of March 1, STANLEY SLATER has become associated with Minnesota Mining and Manufacturing Company in their Detroit plant as chemical engineer. Mr. Slater will be in the material evaluation division. He was formerly chemical engineer for Fabricon Products, Inc. of River Rouge, Michigan.

At a recent meeting, the Board of Directors of the Detroit Section regretfully accepted the resignation as Director of Mr. EBERT KNAUER of the Burroughs Adding Machine Company and unanimously elected Mr. ALVIN N. STOMP of the Una-Craft Engineering Co., Inc. to complete his unexpired term.

We welcome back to the Detroit Section, T. WALTER NOBLE who recently resigned the General Manager's job at the Morart Gravure Corp. of Holyoke, Mass. Previous to going with Morart Gravure, Mr. Noble had been general manager of the Plastics Division at Fabricon Products, Inc. of River Rouge. In 1947 he was president of the Detroit Section of the SPE.

Mr. Noble will do consulting work in the development and production of decorative, graphic, and industrial grade laminates. He may be reached at 7559 Grand River Avenue, Detroit, Michigan.

OUR THUMBNAIL SKETCH:

This month's personality is a quiet individual whose intense capacity for work has made him the "workhorse" of the Detroit Board of Directors. Time and again in situations where a capable and reliable individual was needed, he has filled the bill. For three different years he carried the multiple responsibilities of the program chairman on his shoulders. Another year saw him as Section Treasurer, a job which is certainly no sinecure. Each time he turned in an excellent performance.

Born in Fremont, on October 22, 1914, he has spent his entire life in the Middle West. He was educated at St. John's University in Toledo, Ohio, and subsequently studied part-time at Toledo University. The University of Detroit, and the University of Michigan.

His introduction to plastics came at the Toledo Mold Company where he went to work on the drafting board before he was barely out of his teens. From there he went to Owen's Illinois' Design Control Division as mold and model designer. In August of 1942, he came to Detroit as engineer for the Detroit Mold Engineering Company, and then, a year later, he joined the company he is presently associated with. Starting as product engineer, he has worked his way up to his present job as manager of the plastics department.

His activities in the engineering field are by no means limited to the SPE. He is a member of the SPI and the Detroit Rubber and Plastics Group, and is co-author with Gordon Thayer of a book on Mold Design. For recreation he prefers hunting and fishing or relaxing with his family. Who is he? (See page 7).

CHICAGO TALK IS ON LARGE CASTINGS

By C. R. WEBSTER

The Sunlite Mfg. Co.

The final meeting of the 1948-49 series jointly held by the Chicago Section of SPE and the Midwest Chapter of SPI was presented on May 11th at the Builders Club with 165 members and guests in attendance.

Main attraction of the evening was Louis H. Barnett of Loma Plastics, Inc., Fort Worth, Texas, whose subject was entitled "A New Approach to Large Thermoplastic Castings." His talk was illustrated with some movies which included shots of their new 56 ounce injection molding machine during its construction and in actual operation. The merits of pin point gating were also extolled with sample pieces illustrating its use being passed around through the crowd.

Announcements for future SPE affairs include the National Council Meeting at the Edgewater Beach Hotel on May 26th at 4:00 P.M. The Chicago Section directors have been invited by the national group to attend a position of the business meeting being held at this time during the SPI annual spring conference.

The summer golf outings are to be held on June 10th, July 22nd and September 23rd at Westward Ho. Members of SPE-SPI and guests are cordially invited.

The next business meeting will be held on September 14th and will be put on by SPI. The program will be announced at a later date.

The new SPE membership applications are being processed as fast as possible. The board of directors has appointed itself the credentials committee and will act on all applications in order to insure fair classification ratings for all members. The board feels that it is too important and demanding a job to delegate to a small group and therefore has decided to tackle the task itself. Members are requested to fill out the blanks with complete information and return them as soon as possible.

THE BUYER LOOKS AT PLASTICS

By JOHN M. BOULAIS
Buyer for Stix, Baer & Fuller
St. Louis

A buyer of articles which make up the trade name known as "Housewares," which term embodies all of the thousands of items which go into the kitchen and other parts of the home and which include a great many items of plastic, has to know something about the things he buys. Of all the items in Housewares, there is no category of merchandise which presents such a technical problem as plastics.

The soft goods buyer never buys merely a fabric product; he buys silk or cotton or wool or rayon for the particular properties of each. The furniture buyer doesn't accept a wooden table but rather an oak, maple or mahogany piece. A buyer of plastic items knows that there are at least eleven to fourteen different materials which make up the plastic family with each material having its own characteristic advantage and limitation.

A complete knowledge of these plastic materials is as technical a subject to know as it is difficult to pronounce many of their names. The buyer therefore must rely on the manufacturer to use the plastic material best suited for his product, and on the salesman on his knowledge of the product he is selling. This is not only true on articles made completely of plastic but on articles where plastics are a component part. A buyer will generally measure the relative merit of the plactic made item by:

1—Appropriateness of the plastic for the particular product. Is it the type of item that the consumer will accept in plastic?
2—Is it well designed and styled?
3—Will it perform the function for which it was intended and will it give satisfactory service?
4—Is it priced right?
5—Is it an item which will have customer appeal and possibly sell in volume?

These are the basic requirements of a good plastic item. Successful buying demands an intuitive sense of what has customer appeal plus knowledge of how a product will be used and how it will stand use and abuse. How well they will perform after they have reached the consumers' hands depends on the manufacturers right application of the right plastic material.

It is the plastic designer and the plastic manufacturers responsibility to see that different plastic materials have different properties, some being suited for better application to certain products than others. The plastics industry has done a commendable job in this regard in realizing that their success depended upon their ability to control the proper use and application of plastics.

Retailers of plastic products rightfully feel that they have an obligation to their customers to sell only such plastic merchandise as will provide full value and lasting satisfaction to their customers. The housewife had to be educated to the acceptance, use and care of aluminum cooking utensils when they were first introduced. Because nylon hosiery and clothing of synthetic fabrics had certain limitations and special requirements in laundering, cleaning and ironing it was necessary to educate the consumer in respect to these requisites to insure acceptance and lasting satisfaction, so it is true of plastic products and materials. Proper informative labeling by the manufacturer will go a long way in assuring the continued acceptance of plastics by the consumer, it will also materially assist the salesperson in doing an intelligent selling job. Today the consumer is not buying plastic items solely by trade names but she will soon learn to recognize those plastics which she has received satisfactory service from; what serviceability is expected by the consumer will be influenced to a great degree by the informative labeling which the product bears.

One must realize that at times salespeople at the retail level sometimes become overenthusiastic in making a sale and exaggerate the claims which can be made for a particular item—they also sometimes understate a product's serviceability—this is also true of a great many manufacturers' salesmen. Adequate informative labeling would help to materially correct this condition.

We, at Stix, Baer & Fuller, are convinced that plastic materials and plastic products will have customer acceptance and that this market will expand as new plastic items become available. In our Housewares Department, we have set up a separate accounting classification to accurately determine the sales volume from this classification of merchandise and have found that it has continued each month to increase in sales.

We take full recognition of plastic products—our customers have accepted them and for the majority like them. At one time plastics were looked upon as a substitute material. Recent years have seen plastics recognized more and more, however, as new basic materials, comparable to wood, metal, glass and other conventional materials used by designing engineers. As such, plastics are finding their own fields of application in many cases replacing other materials because of the special advantages they offer in structure and decorative applications and design. Prior to the war we sold in our Bath Shop in shower curtains and drapes about 20% of our sales in plastics whereas today we sell over 90% in plastic materials. The present rate of sales on plastic toilet seats is

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about 80% of our total toilet seat sales. Plastic sales of protective items have accelerated at a terrific rate notably such things as plastic table cloths, table cover protectors and plastic materials such as Marvalon. Other notable items have been plastic beverage pitchers, salad bowl sets, cutlery trays, refrigerator boxes, plastic clothes line, plastic garden hose, mail boxes, as well as all of the miscellaneous gadgets which are made of plastic. Today about 95% of all the kitchen dinette sets which are sold have plastic material tops. It has been proven that plastic made items do not necessarily have to be sold for less than similar items fabricated out of other materials; in a great many cases, they can and do command a higher price.

In the retail toy market about 50% of all the small toy sales are in plastic whereas before the war plastic toys were practically unheard of. The trend upward in this field is likely to continue providing plastic toys are made of more durable material, this is particularly true of small toys for boys. In the toy market for girls, plastics dominate the industry because of the fine detail they give dolls, doll parts and doll house accessories. The use of plastics in furniture structure has to date not proven to be successful as there is seemingly a problem yet to be overcome in the assembly of plastic furniture. The plastic covering material Duran has received customer acceptance.

Throughout the modern department store plastic materials and plastic made items have come into their own. Most departments have some form of representation of the plastic industry. Merchandising men today are very conscious of plastics and are watching them closely.

The future of plastics lies in proper application, intelligent selling and informative labeling.

POLYETHYLENE DATA USE DESCRIBED

By GEORGE A. TAYLOR

Plaskon Div., L-O-F

Mr. James H. Parliman, sales manager, Plax Corporation, discussed "Polyethylene Permeability Data and Their Practical Use" at the June 8 meeting of the Toledo Chapter of the Society of Plastics Engineers.

Mr. Parliman reviewed the simple bag method for obtaining approximate permeability rates, theoretical considerations, method for predicting permeability rates from other known data, effect of temperature, and effect of liquid and gas phases.

New data was presented on the permeability rates of various liquids through polyethylene, including several inorganic acids, organic materials, and various commercially marketed products. The permeation of hydrogen peroxide under both light and dark conditions and change of concentration of ammonium hydroxide was discussed.

Other examples of practical applications of permeability data in packaging problems, including permeability analyses of the components of several liquid cosmetics, were given, along with a discussion of the general over-all problem of evaluation of permeability data for mixtures.

Penn Notes

By PAUL ROCHE

Nosco Plastics

The May 1949 meeting of The Northwestern Pennsylvania Section was a rousing windup to the meeting season. Planning a complete new situation to go with "ladies night," our brethren (and sistren) donned their Sunday best and their cocktail hour eager-beaver expressions and looked in at the new Village Hotel near the peninsula entrance at Erie. Over 70 were in attendance to an almost new record. A social period and delicious chicken dinner were enjoyed, followed by a talk by Mr. James Veverit, secretary of The Buffalo Section, who spoke on "Industrial Design as Applied To Plastics;" Mrs. Veverit also attended. An average of 4 door prizes were taken home by the women, which were donated by Mr. Veverit, Perry Plastics, Koppers Inc., Erie Resistor Corp., Presque Isle Plastics, Applied Plastics Div'n of Keystone Brass Works, Erie Resistor Corp., Louis Marx Co., and NOSCO Plastics. Meeting termination had no bearing on departure and at the deadline of this issue many were still reported to be at the "Village" or otherwise unaccounted for. NOSCO Plastics sponsored the meeting arrangements being in charge of Paul Roche.

Jens O. Pedersen has just completed arrangements for buying out the tool department of Perry Plastics Inc. to be managed by Mr. Pedersen and operated at a new location and under a new name to be announced later. This company will specialize in plastics, die casting, and metal-working dies. The new management will take over also the experienced personnel of the division, bolstering the experience of Jens who formerly held key positions with Anson Tools & Gauges (Erie), Swanson Tool & Machine co. (Erie) and Rathbun Molding Co. (Salamanca, N. Y.)

The Plastics Industry in the area has heard about the business trend and is acting accordingly, but is at the same time completing long term plans on the onward and upward path. Plant extensions are underway or have been completed recently on the part of Presque Isle Plastics, Applied Plastics, Byrd Tool & Mold Co. Quinn-Berry Corp, & J. A. Ferguson Co. New press equipment is being added by Presque Isle Plastics (48 oz. Watson Stillman), NOSCO Plastics (16 oz. Reed Prentice), Louis Marx Co. and Franklin Plastics.

WILLIAM R. BYRD of Byrd Tool and Mold Co. was the "meeting sponsor" for April in the Northwestern Pennsylvania Section. He took his responsibilities seriously, as usual, since not only did he arrange a very interesting program designed around the movie "An Exact Duplicate" by The George Gorton Machine Co., but he brought 100% of his shop personnel to the meeting. This brought the attendance score up to a year's high, rivalling even certain months when there were more door prizes than Mrs. Hush boasted.

NAT REYBURN (Applied Plastics Div'n, Keystone Brass Works, and section treasurer) assumed the responsibility and work of initiating a molding material survey at this meeting. In the form of an "information please" quiz, the subject of Saran material was thoroughly probed from the standpoints of physical properties, molding characteristics, and molds required. On the panel of experts were JAMES MURPHY (Quinn Berry Corp.), JOHN SPECHT (Erie Resistor Corp.), WAYNE OSBORN (Perry Plastics) and GEORGE LAURENSON (Applied Plastics). Being as successful and popular as this program was, consistent with this section's experience on local talent presentations, the general plan is to be carried further to cover other unusual molding compounds in future meetings.

SPE Prize Paper Contest

PRIZES—$200, $100, $50

Anyone is eligible to compete. The paper submitted must be original and unpublished, under 5,000 words, and deal with some phase of the plastics industry. Submit your entry to your local SPE Section before November, or to SPE National Office, Athens, Ohio.

SUNDBERG SPEAKS ON IMPROVEMENT OF DESIGN AT PHILLY

By H. S. STEVENSON

The Philadelphia Chapter of the Society of Plastics Engineers held their April Meeting on April 19th at the Franklin Institute. The featured speaker was Mr. Carl Sundberg of Sundberg & Ferrar and his topic was "Design Improvement for Saleability and Function of Plastic Items."

Good appearance is the first rule in good merchandising. Sales surveys show that regardless of how well the product is engineered, the public is not impressed unless the exterior appearance is pleasing and distinctive. Good design is obvious to the eye of the purchaser, while good engineering is apparent only after a period of use.

A comprehensive design program should not necessarily limit itself to a design of a product. Many manufacturers have found it to be good merchandising to extend their design program to the restyling of their package, show rooms, retail outlets, stationery and calling cards. In other words a style can be created that will apply to any product or property of the company that appears before its public. An easily recognized style applied to all of the company's activities soon becomes a well known trade mark.

An industrial design studio is a clearing house for new ideas and materials. Inventors and manufacturers have found it to be good business to come to us with their new ideas because often among our clients there is one who is looking for the very thing that they have to offer.

In their efforts to design better products, designers are turning more and more to the use of plastics. We like to work with plastics. We have found that wherever a well chosen plastic fulfills the physical requirements of a job, it usually is the best material esthetically. There is hardly an industry from ship building to toy manufacturing in which plastics have not been used by the designer to advantage. Plastics have done more during the past ten years than most any other material to help the designer in the promotion of good product designing.

As a comparatively new material it is rapidly becoming accepted as another basic material like steel, wood, glass and paper and can often do a specific job much better than these old, recognized materials. I cannot think of an industry with a brighter future than the plastics industry.

BALTIMORE-WASHINGTON OFFICERS

Left to right: John B. Alfers, Navy Bureau of Ships, Treasurer; Albert M. Stover, The Glenn L. Martin Co., Vice-President; Gordon M. Kline, National Bureau of Standards, President; William R. Bailey, Navy Bureau of Ordnance, National Councilman; Albert L. Lightbody, Naval Ordnance Laboratory, Secretary.

HISTORY OF BALTIMORE-WASHINGTON

By GORDON KLINE

A group of 18 individuals in the Baltimore and Washington areas met on December 2, 1947, with Mr. T. E. Orr and Mr. J. H. DuBois to discuss the formation of the SPE Baltimore-Washington Section. Mr. W. R. Bailey was designated as chairman of an organizing board. A charter was granted to the local section by the Socity of Plastics Engineers on January 21, 1948. Further meetings of the organizing group were held on February 3 and 17.

The first official meeting of the Section was held March 23, 1948, at the National Bureau of Standards, with Mr. John DeBell as the principal speaker. Mr. J. H. DuBois, the National President of the Society, discussed the objectives of the Society.

Directors to serve through 1949 were elected by a letter ballot of the 53 charter members prior to the second meeting of the Section on May 4, 1948. These directors met following the meeting on May 4 and elected officers. These officers and directors are as follows: President, Gordon M. Kline, National Bureau of Standards; Vice-President, Albert M. Stover, Glenn L. Martin Co.; Secretary, Albert L. Lightbody, Naval Ordnance Laboratory; Treasurer, John B. Alfers, Navy Bureau of Ships; National Councilman, William R. Bailey; additional Directors: W. deCamp Crater, Glenn L. Martin Co.; Peter King, Naval Research Laboratory; Frank W. Reinhart, National Bureau of Standards; Walter R. Sykes, Owens-Corning Fiberglas Corp.

The following committees have been set up to carry on the work of the Section: Professional Activities: E. B. Stratton, Army Map Service, Chairman. Membership: W. R. Sykes, Chairman; W. deCamp Crater; Ray E. Eshenaur, Glenn L. Martin Co.; Clinton Rector, National Engineering Products Inc. Credentials: W. deCamp Crater, Chairman; Paul L. Kingsley, Naval Ordnance Laboratory; Arthur Schroder, Department of the Air Force. Finance: J. B. Alfers, Chairman. Program: Frank W. Reinhart, Chairman; W. deCamp Crater. House: John J. Lamb, National Bureau of Standards, Chairman; John W. Sinner, Glenn L. Martin Co. Publicity: Frank H. Carman, Plastic Materials Manufacturers Association, Chairman. Educational: Peter King, Chairman.

The membership has grown to a total of sixty-five. Most of the membership comes from nonindustrial Washington with a quite large group from Baltimore. Meetings have been held at both Washington and Baltimore, attempting to keep the division about equivalent to that of the membership representation.

The Section decided to meet insofar as possible on the second Tuesday of each month, but this date is subject to change to meet the convenience of our speakers. The meetings have been well attended, with many visitors at times to hear the open discussions which follow the scheduled talk and which are participated in by practically the entire group. It is expected that this lively exchange of ideas will continue to attract the membership of those persons who are vitally interested in plastic materials.

A good indication of our interest in S.P.E. was shown by the fact that over one-fourth of the Baltimore-Washington membership attended the National Meeting in Philadelphia in January 1949.

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SELECTION AND MAINTENANCE OF HYDRAULIC PRESSES—NEW YORK

By A. M. MERRILL

A talk on "Selection and Maintenance of Hydraulic Presses," by Adolphe J. DeMatteo, assistant chief engineer, Watson-Stillman Co., featured the May 10 dinner meeting of the New York Section, held at the Hotel Shelburne. Approximately 45 members and guests attended and heard the talk which was based on a paper given by Mr. DeMatteo at the national meeting.

Using slides to illustrate his talk, Mr. DeMatteo began with a discussion of the principles of press operation, defining the terms "force" and "pressure," and showing the evolution of the basic hydraulic jack into the modern molding press. In discussing press selection, the speaker gave four features desired in compression and transfer molding presses: (1) Die space, a function of the maximum size of die and usually determined by the standard sizes of presses available which, in turn, are governed by press capacities; (2) Press capacity, determined by the area to be molded and the material to be used, seasoned with good judgment; (3) Press speed, determined by pump volume and ram area in a self-contained press; and (4) Press flexibility, determined by pressure and speed control. The speaker emphasized the need for specifying clearly exactly what the press is to do, and the need for ordering any required special features at the time the press is built rather than after delivery.

The field of injection molding machines is practically restricted to standard models which are rated on the basis of ounces of material which can be molded per cycle. The usual method for selecting an injection machine is to compute the weight of shot and the area of the molded part or parts, and select the machine accordingly. Slides of both horizontal and vertical injection machines were shown, and Mr. DeMatteo stated that the trend is toward large-capacity horizontal machines of 60-, 72-, and 80-ounce capacity.

In discussing press maintenance, the speaker noted that the most important factors in assuring long equipment life are the cleanliness and quality of the oil. Conventional strainers or screens and periodic removal of the oil change for cleaning are not too effective. The most economical and successful results have been obtained by independently by-pass filtering the oil while the press is in active operation, using a motor-driven portable filter unit for this purpose. Oil quality, dependent on oxidation, should be determined at regular intervals by checking the neutralization number, as shown by the standard ASTM test.

In the business session preceding the talk, reports were heard from the secretary-treasurer, George Baron, Ideal Plastics Corp., and from the various committee chairmen: membership, George Rice, American Cyanamid Co.; house, Bruno Wessinger, Wess Plastic Molds, Inc.; and program, Palmer Humphrey, G. P. Humphrey Plastics. A further discussion of plans for a Christmas Party was held and members were requested to indicate their preferences as to type of affair. Plastic table favors were distributed through the courtesy of Section president Stanley Bindman, Noma Electric Corp., and there was a drawing for door prizes donated by Harold Schwartz, Empire Brush Works, Inc., and Nicholas Fasano, Washington Molding Co., Inc.

The next regular dinner meeting, on June 14 at the Hotel Shelburne, will feature a talk by Raymond G. Newberg, Esso Laboratories, Standard Oil Development Co., on S-Polymers as new plastic materials of unusual properties. Following the summer recess, an open business meeting will be held on September 13, and will include a showing of the SPI film, "A Scientific Approach to Better Plastics."

UPPER MIDWEST

By E. W. ULRICH

Mr. R. W. Van Sickle of Dow gave us an interesting summary of new thermoplastic molding powders at Dow.

Here are some of the factors he listed in these developments:

a. Lowered cost.

b. Reduced crazing—1. By reducing the volatile content (mfg's responsibility). 2. By reducing strains in the molded part. (molders and mold designers responsibility).

c. Reduced contamination—As little as 0.02% contamination will spoil porcelain white styrene.

d. Improved moldability — They have increased range of temperature and pressure under which ordinary powder can be molded. (Styron 666).

e. Improved light stability—New powders have no preceptible yellowing. (Styron 637).

f. Improved heat resistance—(Styrons 683 and 671). However, even though these have heat distortion points above 212°F, they are not guaranteed against boiling water unless they have been heat treated to relieve strains. High molding temperatures are required, of course.

He also spoke on mold design. Since many molding problems are directly related to the mold design he made suggestions for better molds:

a. Use thicker edges for less air trapping.

b. He explained the short shot method for studying mold design.

c. Mold cooling is important for tricky designs.

d. Mold sticking is often due to designs which stress mold walls excessively. Lubricants reduce molding pressure and thereby give better release.

e. Gate balance is often a factor.

f. Restricted gating is the coming thing since it allows more uniformity of pressure in the mold, gives greater density and less strain in the product, and permits wider mold temperatures. Large gates contribute to crazing.

CHARTER

Ted Ingersoll of Plastics, Inc. has promised to frame our charter certificate—Thanks, Ted.

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PREHEAT IS PRIMARY PROBLEM IN AUTOMATIC TRANSFER MOLDING

By GEORGE W. MARTIN
Noma Electric Co.

The Western New England Section met on May fourth at the Hotel Sheraton, Springfield, Massachusetts.

Program Chairman Mario Petretti introduced the speaker of the evening, Mr. Norman Wilcox, manager of the Methods and Equipment Laboratory of General Electric Co., Pittsfield, Massachusetts. Mr. Wilcox had chosen for his talk "Recent Trends In Automatic Hot Molding, Low Pressure Laminating, And Nylon Extrusion."

His first subject was automatic transfer molding, the primary problem of which is preheating. Mr. Wilcox cited the four common methods of doing this, as follows:

1st—Infra red lamps—material can be heated to as high as 220°F. by this method without adhesion to conveyor.

2nd—Radio frequency preheating of powder in containers—this method is not entirely satisfactory, as the dielectric properties are distorted due to the difference in properties between the container and the material, causing a non-uniform preheated material.

3rd—Steam vapor method—commonly used.

4th—This method uses the principle of mechanically working the material, thereby using friction as the source of heat. This method has been introduced by the Definance Machine Co. It entails forcing the material through a small orifice under high pressure, which heats the material from 250° to 300°F.

After considering preheating, the speaker turned to the mechanical problems of the press. He recommends a very fast acting press with a high rate of closing speed. This speed will cut seconds from the molding cycle and add considerably to the output.

In automatic molding, methods of extraction must be positive. Also, the method of ascertaining the complete extraction is most important. This is commonly done by weighing the extracted shot, using photo-electric cells, and actual counting of the pieces. Much valuable time may be lost, or much damage may result, if a fast, efficient, and positive method is not chosen.

The ideal press should have very low maintenance costs, good accessibility, and be safe, well-guarded, economical to run, and the output must have a reasonable relation to its cost.

On the subject of low pressure molding, Mr. Wilcox outlined the common method of preforming, or felting of the glass fibres, using the vacuum technique. The fibers are sucked onto a screen and sprayed with a liquid resin. The preform is then put into an oven and cured. Preforms made in this manner are limited in thickness because of the fact that as soon as the screen is completely covered, the vacuum is cut off. Mats, or preforms of many sizes or shapes, are possible with this vacuum technique, however, and it has proven quite satisfactory.

The speaker outlined one of the uses in the molding of boats. The molds are either copper or aluminum, backed with steel. A parting agent is sprayed on the mold, and the glass mat is applied. Layers of resin are sprayed on, then a layer of cellophane is applied. Next, a formed rubber bag partially filled with air is inserted, covered with more cellophane, and the deck and gunwhales are added. The air in the bag is then replaced with steam and the molding is allowed to cure for approximately one-half hour.

This method has been superseded, however, with the advent of improved resins, so that today the boats are virtual castings that will cure at room temperatures in approximately seven or eight hours.

The speaker's final subject was nylon extrusion. Due to the high heat required, 500°F., manufactures are turning from oil heat to electric heat for more uniform, efficient results. With nylon, it is customary to extrude directly into water, the temperature of which must be accurately controlled. This is necessary because of the lack of "body" to the extruded material requiring that it be "frozen" to the shape and dimensions desired. In this way it is possible to extrude tubing, ribbon, etc.

One difficulty commonly encountered with nylon extrusion is the adhesion property that makes it so difficult to remove from the worm. Although satisfactory methods have been developed, Mr. Wilcox recommends a salt bath to remove the film from the worm, leaving it in the bath for one-half hour or more. This method is hazardous, however, as the bath builds up such a temperature, 1,000°F. or more, that oxidation of the tank may occur and the whole thing may blow up. For this reason care must be used if this method is utilized.

Secretary Ed Vaill presented a report of a recent Directors Meeting. The directors had voted on going along with the other sections and contributing one dollar per member, or seventy-nine dollars, to the National Society to help offset the deficit incurred at the 1947 National Conference.

The directors also had decided tentatively to hold either a clambake or a golf outing in place of the regular June meeting. A standing vote was taken which was unanimously in favor of a golf outing. Mr. Young then appointed a three-man committee to handle the affair consisting of: Mr. Emil Marciniak, Chairman, A. G. Spaulding Co.; Mr. Richard Plichta, Noma Electric Corp.; Mr. Wesley Larson, DeBell and Richardson.

The members were also reminded that the June issue of the S.P.E. magazine is sponsored by the Western New England Section and were urged to all lend their support to make this issue a success.

ANSWER TO THUMBNAIL SKETCH:

DONALD HOFFMAN of Evans-Winter-Hebb in Detroit.

CENTRAL OHIO OFFICERS NAMED

At the May 12 meeting held at Buckeye Lake the Central Ohio Section elected the following men for the coming year for officers and board members:

President, M. W. Burkhart, Plastic Design and Sales; President-elect, Henry W. Kuhlman, Battelle Memorial Institute; Secretary, L. A. Monaco, Shellmar Company; Treasurer, F. C. Burkhart, Fabri-Form Company; New Directors, Fred Fukal, Fred and Lillian Fukal; R. W. King, Batelle Memorial Institute; John A. Verberg, Shellmar Company; John Neuman, Newark Plastic Molds, Inc.; Remaining Directors, C. D. Jones, L. Monaco, W. J. Braley, E. E. McSweeney, W. Yost, C. E. Bacon.

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in pencil sharpeners or business machines

Here, sound product design provides for the manufacture of pencil sharpeners of two types, using interchangeable parts produced in a single mold. Colorful and attractive . . . rugged and compact . . . durable and strong . . . when molded in high-acetyl acetate it's a product that will cut costs . . . boost sales. Flame-resistant acetate meets the requirements for heat- and flame-resistance in the housing of the motor-driven model.

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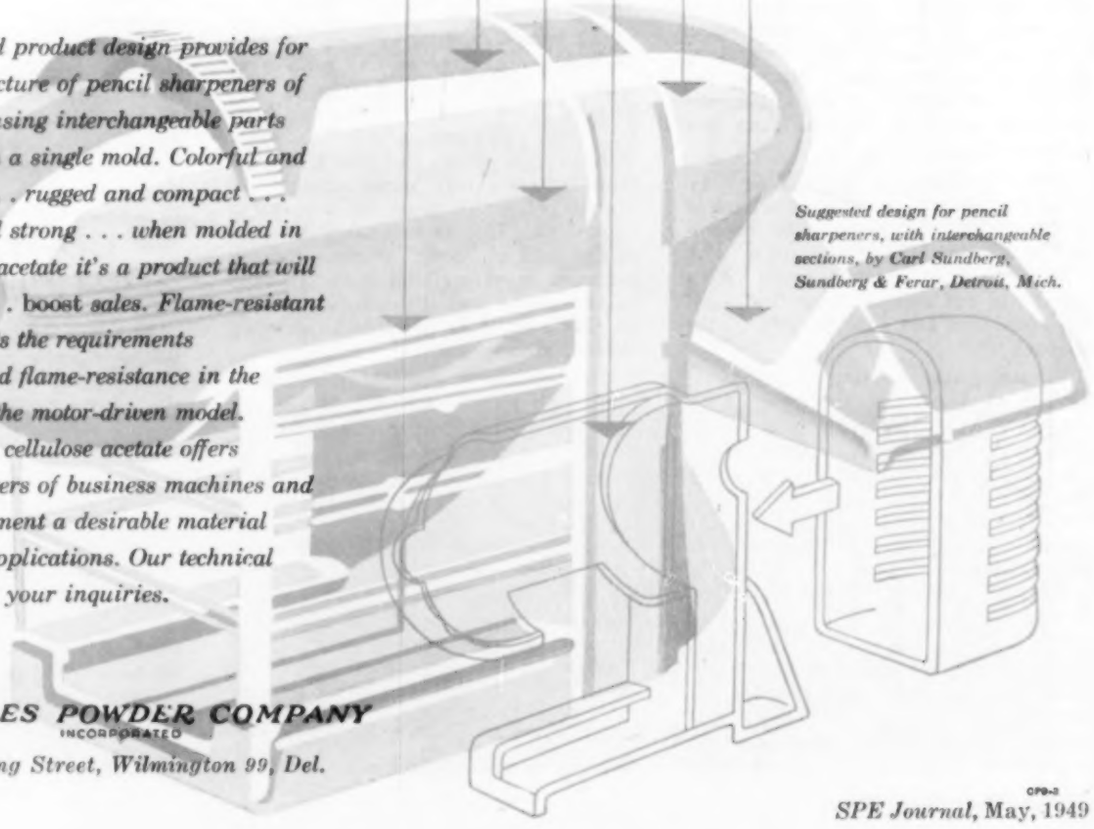

Suggested design for pencil sharpeners, with interchangeable sections, by Carl Sundberg, Sundberg & Ferar, Detroit, Mich.

HERCULES POWDER COMPANY
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CPD-3

Report of the Laminating Committee of the SPE

Bibliography

of

Laminating Procedure and Practice

The first work of this committee dealt with the need for a standard test for determining volatile contents of impregnated materials and flow properties of laminating materials. These standard tests, based on a survey of the industry, and known as S.P.E. 100-M and S.P.E. 101-M were written and reported in November, 1945.

Approximately two years ago it was thought advisable that the S.P.E. Laminating Activities Committee work on a bibliography of published information on laminates. It was finally agreed that a first step in such a bibliography would be to examine Chemical Abstracts from the 1st volume published in 1907 to the current issues and record the abstracts which are of interest to people who are connected in some phase of this industry.

Each of the abstractors below examined Chemical Abstracts for the years given.

Mr. S. Slater—Fabricon Products Co., Detroit, Michigan. Chemical Abstracts 1907-1926.

Mr. O. Pelham—Woodall Industries, Detroit, Michigan. Chemical Abstracts 1927-1934.

Mr. G. Lamont—Reichhold Chemicals, Inc., Detroit, Michigan. Chemical Abstracts 1935-1940.

Mr. H. Kline—Reichhold Chemicals, Inc., Detroit, Michigan. Chemical Abstracts 1941-1948.

Arrangement and indexing was done by Dr. E. E. McSweeney of Batelle Memorial Institute.

Each abstractor used his own judgment as to what he thought would be of interest to the laminating industry.

Thanks are also due Reichhold Chemicals, Inc. for the typing and mimeographing of this bibliography.

Harry Kline
National Chairman
Laminating Activities Committee
Society of Plastics Engineers

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Effect of additions of low-cost petroleum resins to phenol-formaldehyde laminating resins—A. Friedman; Plastics Trends 2, No. 10, 5-6 (1942); C.A. Vol. 37, pg. 198.

Machining of phenolic laminates—S.A. Rulon; Tool & Die J. 8, No. 7, 94-6, 142-6 (1942); Descriptive; C.A. Vol. 37, pg. 697.

Laminated material suitable for electrical insulation, brake and clutch linings etc.—M. T. Harvey (to the Harvel Corp.); U.S. 2,314,701; March 23, 1943; C.A. Vol. 37, pg. 5167; A punching stock is described made from paper or cloth and a resin using phenol and cardanol and HCHO.

Resin-impregnated compressed wood—Jicwood Ltd. and R. L. J. Farina; Brit. 547,128; Aug. 14, 1942; C.A. Vol. 37, pg. 5520; Wood is impregnated with an aq. solution of phenol and hexa, the water is removed and the wood pressed with heat and pressure.

Phenolic materials for wartime demands—F. W. Fogt; Paper Trade J. 117, No. 1, 28-30; C.A. Vol. 37, pg. 5800; A discussion of the use of phenolic materials in the construction of bearings.

Chemical resistance of laminates—C. J. Straka; Modern Plastics 20, No. 11, 80-4, 136, 138 (1943); C.A. Vol. 37, pg. 5800; Discussion of resistance to H-2-SO4 and NaOH of phenolic laminates with various fillers.

Phenolic resin boards—Properties and applications—C. A. Nash & E. W. Vaill—Product; Eng. 14, 638-40 (1943); C.A. Vol. 38 (1944) pg. 181.

Phenolic resin composition suitable for molding, use in laminating varnishes and for other purposes—C. W. Bowden, Jr. (to Hercules Powder Co.); U.S. 2,324,758; July 20; C.A. Vol. 38, pg. 185.

Molded bobbin heads from sisal fibers and phenolic resins—Milo C. Dodge (to Columbian Rope Co.); U.S. Pat. 2,326,526; Aug. 10; C.A. Vol. 38, pg. 599.

High strength phenolic paper laminates—G. K. Dickerman; Paper Trade J. 118, No. 26, 33-6 (1944); C.A. Vol. 38, pg. 4341.

Effect of moisture on the physical properties of paper-base plastics—A. H. Croup; Paper Trade J. 118 No. 20, 43-6 (1944), C.A. Vol. 38, pg. 4338.

Effects of thermoelastic forming in properties of thermosetting laminates—W. I. Beach; Modern Plastics; Jan., 1944, 41-5, 68-9; C.A. Vol. 38, pg. 5022.

Flexible laminated sheets—N. I. Artamoklim & P. M. Kuzlov & D. A. Kardahev; Russ. Pat. 56,215; Dec. 31, 1939; Use phenol aldehyde resin plus benzyl cellulose in an alcohol benzol solvent mixture to produce flexible laminates; C.A. Vol. 38, pg. 4723.

Liquid coating composition containing resins and adopted for use on paper, cloth, plywood layers or other materials—R. L. Smith (to Carborundum Co.); U.S. Pat. 2,351,716; June 20, 1944; Mixtures or suspension of solid grindable resin in a liquid reactive resin and water; C.A. Vol. 38, pg. 5339.

Manufacture of phenoplastics from brown coal tar cresols—Z. Csuros & I. Retri Magyar; Chem. Folyoirat 49, 11-26 (1943); Resins with cresols of varying Meta content etc.; C.A. Vol. 38, pg. 6005.

Phenolic resins for paper-base laminates—H. Kline; Pacific Plastics Mag. 2, No. 9, 32-4 (1944); Paper Trade J. 119, No. 13, 30-2 (1944); Resin modifications etc. discussed; C.A. Vol. 38, pg. 6006.

Influence of temperature on molded phenolic materials—T. S. Carswell, D. Telfair & R. U. Haslanger; Prod. Eng. 15, 647-8 (1944); C.A. Vol. 38, pg. 6424.

A liquid-phenol HCHO resin dispersion suitable for use in molded products, etc.—G. F. D'Alelio (to General Electric Company); U.S. Pat. 2,357,090; 8-29-44; C.A. Vol. 39, pg. 440-441.

Ribbed roof structure for laminated artificial material—E. Komenda; U.S. Pat. 2,347,566; April 25, 1944; C.A. Vol. 39, pg. 228.

Paper-base laminates for aircraft—L. H. Ritter; Plastics (Chicago) 1, No. 7, 30-2 (1944); C.A. Vol. 39, pg. 643; Description and properties of high strength paper phenolic laminate.

Reinforced plastic molded bodies—F. Moss; Brit. Pat. 554,737; C.A. Vol. 39, pg. 644-645; A plastic of woven paper fabric and phenolic resin.

Plastic printing plates—J. A. S. Morrison; Patra J. 7, 66-73 (1944); Plastic printing plates from fiberboard, paper etc. & phenolic resin; C.A. Vol. 39, pg. 1082.

Laminated material—H. M. Elsey; Can. 423,272; Oct. 17, 1944; Refrigerator panels using melamine surface sheets & phenolic filler; C.A. Vol. 39, pg. 1088.

Paper-base laminates—T. A. Howells, H. F. Lewis; Ind. & Eng. Chem. 37, 264-8 (1945); Review of development of low pressure laminates, comparative data on laminates with phenolic, furane, allymer, melamine, urea and vinylite; C.A. Vol. 39, pg. 1781.

Phenolic resin reinforced with glass fibers—R. W. Auxier (to Can. Westinghouse); Can. 425,665; Feb. 20, 1945; C.A. Vol. 39, pg. 1782.

Properties of laminated phenolics—L. E. Caldwell; Modern Plastics 20, 82-7, 138 (1943); C.A. Vol. 39, pg. 2429; Description of types and properties.

Physical-strength properties of molded fiber-resin performed materials—R. H. Mosher & J. B. Griffin; Modern Plastics; Feb., 1945; 43-8; C.A. Vol. 39, pg. 2225.

The characteristics of the phenolic laminates—D. Warburton-Brown; Plastics (London) 8, 177-186 (1944); C.A. Vol. 39, pg. 2010.

Papreg-The development of a paper plastic—E. C. O. Erickson & G. E. Mackin; Trans. Am. Soc. Mech. Engr. 67, 267-77; Descriptive article; C.A. Vol. 39, pg. 2905.

Moldable resin-bonded fiber composition—A. J. Hanley (to Bakelite Corp. & Respro. Inc.); U.S. Pat. 2,378,477; June 19, 1945; Wadding of cotton impregnated with phenolic resins, etc.; C.A. Vol. 39, pg. 3971.

Hot-forming of phenolic laminates—H. C. Guhl; Mech. Eng. 67, 175-9 (1945); C.A. Vol. 39, pg. 4261.

Low-resin content and resin-free pulp plastics—S. L. Schwartz etc.; Paper Trade J. 121, No. 7, 35-8 (1945); C.A. Vol. 39, pg. 4775.

The mechanism of formation and the structure of phenol-aldehyde plastics—A. A. Vansheidt; C.A. Vol. 40, pg. 494.

Plasticized resin compositions—Harry Kline (to Bakelite); U.S. 2,380,599; July 31, 1945; Plasticized resin for laminates; C.A. Vol. 39, pg. 5127.

Technology of phenolic resins-correlation of the various types on a common basis—A review—A. Lewin & P. Robtischek; Brit. Plastics 17, 316-22, 385-91 (1945); C.A. Vol. 40, pg. 239.

Phenolic resin-bonded glass fibers—R. W. Auxier (to Westinghouse) U.S. 2,372,048; March 20, 1945; C.A. Vol. 39, pg. 5563.

Manufacture of Compreg in Germany—R. Richardson and G. M. Kline; Modern Plastics 23, No. 7, 155-9 (1946); C.A. Vol. 40, pg. 2687.

Binder for laminated products—Bakelite Ltd.; Brit. 559,684; March 1, 1944; The condensate in product of an alkyl-substituted phenol with an aldehyde in the presence of a basic catalyst is plasticized with an alkyl ester of abietic acid in the amount of 10-30% of the compn.; C.A. Vol. 40, pg. 502.

Laminated materials—E. H. G. Sargent; Brit. Patent 563,950; Sept. 6, 1944; C.A. Vol. 40, pg. 3023.

Hot-forming laminated phenolic plastics—E. Perry; Brit. Plastics 17, 279-82 (1945); Properties of Micarta 444 listed; C.A. Vol. 40, pg. 4909.

Phenolic sheet material—A. S. Peterson, W. I. Beach & R. L. Whaun; Can. 437,043; Sept. 17, 1946; Post-forming patent.

Thermosetting resin—E. Sargent; Brit. 567, 128; Jan. 30, 1945; C.A. Vol. 41, pg. 1493; Resin from phenol, cresol etc. and formaldehyde and a fatty acid amide has possibilities in laminates.

Effect of sodium hydroxide on "Compreg"—R. Paulson and W. Gilchrist; Plastics Trends 6, No. 2, 5-6 (1946); C.A. Vol. 41, pg. 1132; Effect of varying strength NaOH solutions on birch Compreg made with a water soluble phenolic resin.

Wood treatment with urea-resin forming systems-comparison with phenolic resins for making Compreg—M. Millett and A. Stamm; Modern Plastics 24, No. 6, 159-60, 208, 210, 212; C. A. Vol. 41, 2932.

Heat-resisting phenolic laminate—P. P. Ryan (to St. Regis Paper Co.); U.S. 2,415,763; Feb. 11, 1947; C.A. Vol. 41, pg. 3322; Describes a typical production of laminate using low resin content filler sheets and high resin surface sheet.

Water-soluble phenolic resins—The Distillers Co. Ltd.—J. Morgan & B. Frenkel; Brit. 581, 127; Oct. 2, 1946; Use of a soap to help water soluble properties of phenol-HCHO resins for possible use for impregnation of cloth etc. for laminates; C.A. Vol. 41, pg. 3319.

Creep, long time tensile, and flexual fatigue properties of melamine and phenolic plastic materials—D. Telfair, C. Adams, & H. Mohrman; Trans. Am. Soc. Mech. Engr. 69, 789-93 (1947); C.A. Vol. 41, pg. 7812.

Laminated materials of artificial resin and glass fibers—F. Bollenrath; Kunstoffe Ver Kunstoff-Tech. U. Anwend 36, 73-80 (1946); C.A. Vol. 42, pg. 2469; Woven glass silk and phenolic resin cured in various shapes. Describes mech. properties and some applications.

Treating phenolic sheet—Wm. I. Beach & R. L. Whaun & A. Peterson (to North American Aviation Inc.); U.S. 2,433,643; Dec. 30, 1947; Deals with the process of post-forming cloth-phenolic laminates.

Effect of simulated service conditions on plastics—W. A. Crouse etc.; Nat'l Advisary Comm. Aeronant Tech. Note No. 1240, 21 pp. (1947); C.A. Vol. 42, pg. 2470; Asbestos-fabric phenolic laminate and glass fabric unsaturated polyester laminate were found to be the most resistant in exposure to various combinations of moisture, heat, and ultraviolet light.

Causes of dimensional instability of paper-base phenolic resin laminates on total immersion in water—C. J. Straka (Westinghouse Elec. Corp.); Paper Trade J. 126, No. 14, 50-4 (1948); C.A. Vol. 42, pg. 4389; By means of curves, the effect of nature of the resin, the type of paper, and the method of treating and molding the laminate on the dimensional stability is shown.

Phenol-formaldehyde resin-glycinin protein emulsion—P. K. Porter (to Westinghouse Elec. Corp.); U.S. 2,436,328; Feb. 17, 1948; C.A. Vol. 42, pg. 3619; Emulsions of phenol or cresol-formaldehyde resins and glycinin protein derived from soy beans are prepared and added to the beater. Laminates are prepared from such sheets. See also U.S. 2,436,329.

Phenolic resin accelerator—R. R. Whetstone (to Shell Development Co.); U.S. 2,441,860; May 18, 1948; C.A. Vol. 42, pg. 6162; A rapid-curing resin superior in color stability and other physical properties is obtained when 0.5-5% of 3.5 xylenol is combined with a partially cured phenolic resin by milling, mixing, or pptn. from a common solvent.

Phenol resin. The resin from hexamethylenetetraminetri-phenol—T. Miyoshi; J. Soc. Chem. Ind. Japan; Insulating products are obtained from above resin; C. A. Vol. 42, pg. 6154.

Laminates from purified cotton linters sheet—M. Gallagher and R. Seymour (Univ. of Chattanooga); Modern Plastics 25, No. 12, 117-18, 171-3 (1948); C.A. Vol. 42, pg. 8020; Laminates were made from chem. cotton sheets impreg. with polyester, phenolic, and thermoplastic resins. Rockwell hardners M, H^2O absorption and mechanical properties of the various laminates were tabulated.

The swelling of reinforced plastics—F. T. Barwell and K. W. Pepper; Trans. Farady Soc. 42B, 275-82; C.A. Vol. 42, pg. 8519; Discusses causes for swelling of laminates, etc.

I. AMINO

Resin impregnating fiber composition—R. H. Kienle and W. J. Scheiber to Brit. Thomson-Houston Co.,; Ltd. Brit. 393,412; June 8, 1933; Laminated pulp product containing phenol, urea, or alkyd.; C.A. Vol. 27, 5910[9].

Urea-aldehyde condensation products—Soc. Pour L'Ind. Chim. a Bale.; Brit. 413,439; July 19, 1934; C.A. Vol. 29, 252; Water soluble product suitable for impregnating fabrics, paper, etc. among others.

Flexible laminated sound records—Samuel Whyte (to Radio Corp. of America); U.S. 1,997,398; April 9, 1935; C.A. Vol. 29, 3750; Describes a laminate with a core of paper impregnated with urea-formaldehyde resin with a surface of a cellulose ester.

Impregnating paper with resinous binders—Gerald H. Mains (to Canadian Westinghouse Co. Ltd.); Can. 357,298, Apr. 21, 1936; C.A. Vol. 30, 4008; Describes impregnating paper with a urea or thiourea resin up to 30-70%.

Urea-formaldehyde resins and compositions—Bakelite Ltd.; Brit. 449,898, July 2, 1936; C.A. Vol. 30, 8436; Paper impregnated with these resins may be built up into laminated articles.

Compound sheet material—Soc. pour l'ind. chim. a Bale; British 443,449, Feb. 28, 1936; Describes a decorative laminate using a urea resin as the binder; C.A. Vol. 30, 5332.

Laminated sheets suitable for electrical insulation, etc.—Kurt Ripper; U.S. 2,066,421, Jan. 5, 1937; C.A. Vol. 31, 1119; Describes a laminate of paper, linen, or asbestos bound together with a thiourea-CH^2O resin.

Laminating sheets of paper or woven fabric—Alphonse Gams and Theodor Sutter (to Soc. pour l'ind. chim. a Bale); U.S. 2,076,456, April 6, 1937; C.A. Vol. 31, 3599; Describes a permanently fusible, non-hardening amine-CH^2O resin for use in laminated material.

Aminotriazine-aldehyde condensation products—Soc. pour l'ind. chim. a Bale.; Brit. 468,677, July 9, 1937; C.A. Vol. 32, 687; Describes a product suitable for use as a binding-agent in laminated products.

The use of the polymerization products of turpentine as plasticizers—B. N. Rutkovskii, K. Andrianov and A. Lebedev; Org. Chem. Ind. (U.S.S.R.) 4, 104-9 (1937); C.A. Vol. 32, 1807; Describes advantages of this plasticizer in urea-CH^2O laminated and molded products.

Aminoazine-aldehyde condensation products—Soc. pour l'ind. chim. a Bale.; Brit. 486,519, May 30, 1938; C.A. Vol. 32, 8633; Describes a product suitable for impregnating textile webs and forming laminated bodies therefrom.

Synthetic resins—The Resinous Products & Chemical Co.; Brit. 498,043 Jan. 3, 1939; C.A. Vol. 33, 3922; Describes a urea resin which may be used as a binding material for molded or laminated products and as an adhesive.

Plastics and paper—J. F. Maguire; By Gum (Detroit) 9, No. 4, 8-9 (1939); Rev. Current Lit. Paint Colour Varnish & Allied Ind. 12, 324 (1939); C.A. Vol. 33, 9480; Includes a discussion of laminated products of phenolic and urea resins.

Laminating sheet material such as those of cellulose with urea-formaldehyde resin—Oskar R. Ludwig (to Rohm & Haas Co.); U.S. 2,187,383, Jan. 16, 1940; C.A. Vol. 34, 3402; Describes a laminate in which the sheet material is impregnated with an aq. emulsion of polymerized methyl acrylate before impregnation with the urea-resin.

Sound records—W. Zerweck & K. Keller & P. Pinten (to I. G. Farbennd A.G.); U.S. Pat. 2,231,836, Feb. 11; C.A. Vol. 35, pg. 3368; Paper is treated with a melamine-formaldehyde resin and cured with heat and pressure.

Preparing resinous sirups suitable for laminating treating paper etc—P. Schroy & R. Hofferbert (to American Cyanamid Co.); U.S. 2,242,484, May 20; Urea-formaldehyde resin containing alcohol etc.; C.A. Vol. 35, pg. 5597.

Aminoplast compositions suitable for laminating and molding—G. F. D'Alelio (to Gen. Elec. Co.); U.S. 2,293 454, Aug. 8; C.A. Vol. 37, pg. 974.

Heat-curable aminoplast compositions suitable for casting, molding, coating or laminated purposes—G. F. D'Alelio (to General Elec. Co.); U.S. 2,322,566, June 22; C.A. Vol. 38, pg. 184.

Melamine laminates—R. H. Malamphy; Paper Trade J. 119, No. 13, 36-8 (1944).

Laminated materials—American Cyanamid Co.; Brit. Pat. 551,127, Feb. 9, 1943; C.A. Vol. 38, pg. 1822.

Ribbed roof structure for laminated artificial material—E. Komenda; U.S. Pat. 2,347,566, April 25, 1944; C.A. Vol. 39, pg. 228.

Laminated material—H. M. Elsey; Can. 423, 282, Oct. 17, 1944; Refrigerator panels using melamine surface sheets & phenolic filler; C.A. Vol. 39, pg. 1088.

Paper base laminates—T. A. Howells, H. F. Lewis, Ind. & Eng. Chem. 37, 264-8 (1945); Review of development of low pressure laminates, comparative data on laminates with phenolic, furane, allymer, melamine, urea and vynilite; C.A. Vol. 39, pg. 1781.

Resin impregnated fibrous materials—L. Smidth; U.S. Pat. 2,376,200, May 15 1945; Urea HCHO resin for above; C.A. Vol. 39, pg. 3694.

Paper & Amino plastics—C. H. Pottenger; Paper Trade J. 120, No. 23, 29-31 (1945); C.A. Vol. 39, pg. 3693.

Melamine plastics—E. E. Halls; Plastics (London) 9, 159-73 (1945); C.A. Vol. 40, pg. 2685; A summary of properties of melamine resin molding compounds, laminates and finishes.

Melamine-bonded fiberglas laminates—G. A. Albert; Plastics (Chicago) 3, No. 6, 82, 105-8 (1945); C.A. Vol. 40, pg. 3295.

Glass fabric melamine resin laminates—C. J. Strako; Plastics 5, No. 2, 62-6, 68-70, 80-1 (1946); C.A. Vol. 40, pg. 5597.

Melamine-glass cloth laminates-properties & machinability—P. C. Fuller; Product. Eng. 17, No. 2, 142-5 (1946); C.A. Vol. 40, pg. 5954.

Wood treatment with urea-resin forming systems-comparison with phenolic resins for making Compreg.—M. Millett and A. Stamm; Modern Plastics 24, No. 6, 159-60, 208, 210, 212; C.A. Vol. 41, 2932.

Laminating with melamine resins—J. Noble; Plastics (Chicago) 5, No. 6, 46-48-9, 94-5 (1946); C.A. Vol. 41, pg. 2602; Descriptive.

Methods for combining phenolic resins and paper—E. Bauer; Paper Trade J. 125, No. 3, 502 (1947); C.A. Vol. 41, pg. 5749; Off-machine, wet webs, and beater addn. methods or combining phenolic resins and paper are described. Data for costs, grades available & applications are discussed.

Low pressure laminate—J. Delmonte; U.S. 2,419,440, April 22, 1947; C.A. Vol. 41, pg. 4966; Low pressure laminate is made by bonding alternate layers of glass cloth using a mixture of melamine HCHO resin and plaster of paris using HCl as the curing agent.

Laminated products—W. Walker & Sons, Ltd.; J.R. Alexander etc.; Brit. 468,602, April 12, 1945; Laminated leather products using Urea-HCHO resins and curing by immersing in a high boiling inert organic liquid such as fat or wax; C.A. Vol. 41, pg. 4334.

Laminated material—L. S. Meyer (to Libbey-Owens-Ford Glass Co.); Can. 439,904, Feb. 25, 1947; C.A. Vol. 41, pg. 4010; Layers of fabric containing some glass fiber and some cellulose fiber is impregnated with a phenol-HCHO binder. The cellulose fibers prevent the sepn. of the glass fibers from the resin and give the product great strength.

Creep, long time tensile, and flexual fatigue properties of melamine and phenolic plastic materials—D. Telfair, C. Adams, & H. Mohrman; Trans. Am. Soc. Mech. Engr. 69, 789-93 (1947); C.A. Vol. 41, pg. 7812.

Urea and melamine resin products-properties and applications—M. H. Bigelow and J. A. Murray; Product Eng. 18, No. 8, 140-5 (1947); C.A. Vol. 41, pg. 7155.

Resin-impregnated fibrous laminate—K. Fredrick etc. (to Firestone Tire & Rubber Co.); U.S. 2,424,923; C.A. Vol. 42, pg. 413; Laminates from a fibrous material and urea-formaldehyde condensate and a butadiene-styrene copolymer.

Electrical insulation—C. F. Hill and R. Auxier (to Westinghouse Elec. Corp.); U.S. 2,439,929, April 20, 1948; Organic electric insulation having good arc resistance with no creeping or tracking at high voltage is described. The use of melamine-aldehyde resins on the surface areas produces such insulation.

Plastic laminated wood—A. A. Berlin; U.S.S.R. 67,247, Oct. 31, 1946; C.A. Vol. 42, pg. 5275; Plywood sheets are saturated with a solution of cyanamide, dicyanomide thiourea, melamine, or a mixture of these, cemented with a resin and cured at 160°. Product has high tensile and impact strength etc. and is resistant to pentration by bullets.

I. ANILINE

Laminated material suitable for use in furniture manufacture—Gustave E. Landt (to Continental Diamond Fibre Co.); U.S. 2,003,752, June 4, 1935; C.A. Vol. 29, 4856; Material comprises fibrous sheet material impregnated with aniline-formaldehyde united with a metal sheet.

Thermoplastic resins from aniline condensation products—Karl Frey; Kunstoffe 25, 305-8 (1935); C.A. Vol. 30, 1147; Chemistry and properties of the resin and products made from them, e.g., impregnated paper.

Laminated Materials—E. H. G. Sargent; Brit. Patent 563,950, Sept. 6, 1944; C.A. Vol. 40, pg. 3023.

Aniline resins & aniline resin laminates as electrical insulating materials—L. Codolini; Kunstoffe, 33, No. 7, 183-6 (1943); C.A. Vol. 38, pg. 3043.

I. COUMARONE-INDENE

Natural and Artificial Resins—A. Tschirch; Schweiz. Apoth.-Ztg. Vol. 58, p. 485; C.A. Vol. 15, Part 1, p. 767; A description of resins—natural and artificial. Bakelite and Coumarone are some of these resins mentioned and described.

Artificial Resins—A. Tschirch; Seife, Vol. 44 p. 288; Chimie & Industrie, Vol. 6, p. 88; C.A. Vol. 15, Part 2, p. 3215; A review of the various sources of synthetic resins, aldehyde resins, coumarone, methylene-phenol and miscellaneous resins.

Synthetic Resins—Clement & Riviere; Chimie & Industrie, Vol. 8, pg. 38; C.A. Vol. 16, Part 2, p. 3404; The preparation of Bakelite and coumarone resins, and the method of molding them for insulators.

New applications of Phenol Resins in the Chemical and Allied Industries—L. V. Redman; J. Ind. Eng. Chem. Vol. 15, p. 677; C.A. Vol. 17, Part 2, p. 2789; A summary of the most recent of phenol resins.

Natural and Artificial Resins—A. Tschirch; Schweiz. Apoth.-Ztg. Vol. 58, p. 485; C.A. Vol. 15, Part 1, p. 767; A description of 2, p. 3404; The preparation of Bakelite and Coumarone are some of these resins mentioned and described.

Preparation of Coumarone Resin—S. Hirano; J. Chem. Ind. Japan, Vol. 25, p. 827; C.A. Vol. 17, Part 2, p. 3423; A complete laboratory description of a coumarone resin preparation is explained.

Laminated sheets—John A. Kenny (to Barrett Co); Can. 354,906, Dec. 4, 1935; C.A. Vol. 30, 1902; A coumarone-indene resin is pptd. on fibrous pulp. The pulp is formed into a sheet, dried and then the sheets are pressed together to form a laminated product.

Laminated product—Leslie T. Sutherland (to Barrett Co.); Can. 356,182, Apr. 6, 1937; C.A. Vol. 31, 4021; Several superimposed plies of fibrous material are sat'd with coumarone resin and subjected to heat and pressure in the presence of a phenolic resin.

Laminated material suitable for roofing, etc.—Leslie T. Sutherland (to Barrett Co.); U.S. 2,082,854, June 8, 1937; C.A. Vol. 31, 5535; A laminated structure which has as a binder a coumarone resin and an oil-soluble phenolic resin.

I. POLYESTER

Laminated sheet material containing synthetic resins—Bakel Corp; Brit. 300,836, February 10, 1928; C.A. Vol. 23, 4090[1]; Paper or cloth impregnated with glycerol-phthalate type resins and the sheets are bonded with a phenolic resin.

Articles such as laminated products from cellulose material and synthetic resins—H. C. Rohlfs to (General Electric); U.S. 1,866,372 July 5; Alkyd laminate; paper or cloth; C.A. Vol. 26, 4428[1].

Resin impregnating fiber composition—R. H. Kienle and W. J. Scheiber to Brit. Thomson-Houston Co., Ltd.; Brit. 393,412, June 8, 1933; Laminated pulp product containing phenol, urea, or alkyd; C.A. Vol. 27, 5910[5].

Molding and impregnating compositions—Ellis-Foster Co.; Brit. 497,175, Dec. 14, 1938; C.A. Vol. 33, 3488; Describes a polyester such as diethylene glycol maleate which may be used in impregnating paper or canvas which in turn could be laminated by heat and pressure.

Adhesives suitable for laminating paper, cloth, foils, films etc.—John H. Lang (to Hercules Powder Co.); U.S. Pat. 2,224,035, Dec. 3, 1940; C.A. Vol. 35, pg. 1901.

Laminated materials for various uses—D. E. Edgar (to E. I. duPont deNemours & Co.); U.S. 2,234,236, Mar. 11; C.A. Vol. 35, pg. 3744; Layers of cloth etc. are joined by a film of thermoplastic cement comprising cellulose nitrate and a polyhydric alc-polybasic and resin, etc.

Paper base laminates—T. A. Howells, H. F. Lewis. Ind. & Eng. Chem. 37, 264-8 (1945); Review of development of low pressure laminotes, comparative data on laminates with phenolic, furane, allymer, melamine, urea and vinylite; C.A. Vol. 39, pg. 1781.

Data on low-pressure laminating resins—Modern Plastics 23, No. 10, 144-5 (1946); C.A. Vol. 40 pg. 5289.

Thermosetting vinyl polymers—E. L. Kropa; Trans. Electrochem. Soc. 90, 15pp. (1946); Discusses contact laminating resins and their uses during the war; C.A. Vol. 41, pg. 311.

Production fabrication of polyester resins—S. M. Shobert; Inc. Plastics 2, No. 11, 13-16, 30 (1947); C.A. Vol. 41, pg. 3995; Fabrication techniques, conventional dies, resins injection etc. are discussed.

Alkyd-vinyl insulation proves its worth—E. L. Schulman (Westinghouse Electric Corp.); Plastics (Chicago) 8 No. 1, 50-1 58 (1947); C.A. Vol. 42 pg. 3211; A laminate made of asbestos impregnated with an alkyd vinyl resin replaces Mica as insulation for commutator bars. A table compares the phys. & elec-properties of Micarta 8564 insulation with those of Mica.

Coumarone Resins & Formalities—M. Ragg; Farben-Ztg. Vol. 25, p. 16; C.A. Vol. 14, Part 1, p. 642; A review of literature on these resins and on the general properties of various phenol-formaldehyde condensation products.

Resinous polymerization products—British-Thomson-Houston Co. Ltd.; Brit. 576,944, April 29, 1946; C.A. Vol. 42, pg. 3619; Materials suitable for use in molding, laminating, casting, coating, and adhesive applications are prepared by heating in the presence of a polymerization catalyst a mass comprising a sol. heat convertible partial polymer of P- or M-divinyl benzene and an unsat. alkyd resin.

Laminates from purified cotton linters sheets—M. Gallagher and R. Seymour (Univer. of Chattanooga); Modern Plastics 25, No. 12, 117-118, 171-3 (1948); C.A. Vol. 42, pg. 8020; Laminates were made from chem. corron sheets impreg. with polyester phenolic, and thermoplastic resins, Rockwell hardness M, water absorbtion and mechanical properties of the various laminates were tabulated.

I. LIGNIN

Laminated plastic—S. I. Ushakov, Ya. M. Lukomskii, and S. I. Kucherenko; Russ. 53, 609, July 31, 1938; C.A. Vol. 34, 5567; Veneer sheets are held together by paper pasted with aq. suspensions of resin of the type phenol-cellulose and phenol-lignin, which are incorporated in the paper on the roll.

Plastics from lignin and wood—Geo. H. Tomlinson II; Pulp & Paper Mag.; Canada 42, 91-2, 120; C.A. Vol. 35, pg. 3080.

Light-colored liquo-cellulose fiber suitable for making sheets or boards—H. W. Morgan & B. O. Stewart (to Masonite Corp.); U.S. 2,234,188, March 11; C.A. Vol. 35, pg. 3817; A process of making steam exploded fiber which is light colored using alkali sulfate to impregnate wood chips before exploding with steam, etc.

Tough products such as press boards or laminated material from lignocellulose, etc.—W. H. Mason and R. H. Bochm (to Masonite Corp.); U.S. 2,303 345, Dec. 1, 1942; C.A. Vol. 37, pg. 2578.

Plastics from lignin—R. S. Aries; Chemical Industries 56, 226-30 (1945); 416-20 (1945); C.A. Vol. 39, pg. 2905.

Lignin-filled laminated-paper plastics—U.S. Forest Products Lab. etc.; Paper Trade J. 122, No. 14, 35-42; C.A. Vol. 40, pg. 3642-43.

Present and future technical developments in wood and in paper-base plastics and lignoplastics—Am. Matagrin; Papeterie 68, 39-43, 70-73, 106-7, 109-110 (1946); C.A. Vol. 41, pg. 857; A resume.

New form of lignin—N. B. Powter (Howard Smith Paper Mills, Ltd.); Paper Ind. Paper World, 28, 1744-6 (1947); C.A. Vol. 41, pg. 3617; Describes uses of lignin in preparation of a laminated board.

I. SOYABEAN

Protein plastics from soybean products—Laminated material—G. H. Brother, L. L. McKinney & W. Suttle; Ind. Eng. Chem. 32, 1648-51 (1940); C.A. Vol. 35, pg. 1541.

Soybean plastics—Geo. H. Brother; Chem. Eng. News 20, 1511-12 (1942); C.A. Vol. 37, pg. 478; The use of such resins in laminates is discussed.

Phenol-formaldehyde resin-glycinin protein emulsion—P. K. Porter (to Westinghouse Elec. Corp.); U.S. 2,436,328, Feb. 17, 1948; C.A. Vol. 42, pg. 3619; Emulsions of phenol or cresol-formaldehyde resins and glycinin protein derived from soy beans are prepared and added to the beater. Laminates are prepared from such sheets. See also U.S. 2,436,329.

I. SILICONE

New silicone resins boost insulation temperature limits—G. L. Moses; Westinghouse Engr. 4, 138-41 (1944); C.A. Vol. 38, pg. 6006.

The Silicones-new heat-resistant plastics—E. Dans, Pacific Plastics Mag. 3, No. 6, 28-9; C.A. Vol. 38, pg. 4519.

Silicone resin bonded laminates—L. V. Larsen, Whelten & Pyle; Mod. Plastics 23, No. 6, 160-2, 192, 194 (1946); A review; C.A. Vol. 40, pg. 2684.

The Silicone plastics—E. E. Halls; Plastics (London) 10, 376-81 (1946); C.A. Vol. 41, pg. 1875; A Review.

The Silicone plastics—E. Halls; Plastics (London) 10, 406-15 (1946); C.A. Vol. 41, pg. 2932.

Significant improvements in Silicone resins—D. C. Youngs & M. Kin; Plastics & Resins 5, No. 12, 13-18 (1946); Discusses production and properties of Silicone glass cloth laminates, etc.; C.A. Vol. 41, pg. 3997.

I. RESORCINOL

Resorcinol aldehyde resins—G. S. Petrov & A. P. Grigor'ev; J. Chem. Ind. (U.S.S.R.) 18, No. 4, 23-4 (1941); C.A. Vol. 38, pg. 3747.

Resorcinol resins and adhesives—**P. H. Rhodes**; Modern Plastics Dec. 1944, pg. 58-9; Discussion of chem. & physical properties and applications; C.A. Vol. 39, pg. 641.

Resorcinol-HCHO resin—P. H. Rhodes (to Pennsylvania Coal Products Co.); U.S. 2,385,372, 9-25-45; Resorcinol is heated in aq. formaldehyde without a catalyst. The reaction is then completed in the presence of an acid or alk. Catalyst. Since the last step involves little increase in viscosity the water can be readily and almost completely removed from the final product; C.A. Vol. 40, pg. 241.

Resinous reaction products from resorcinol and formaldehyde—Westinghouse Elect. International Co.; Brit. 590,622, July 23, 1947; Discusses the production of a stable resin and its use in laminates; C.A. Vol. 42, pg. 412.

I. FURANE

Action of Furfural on Phenols—E. Beckman & E. Dehn; Sitzb. kgl. preuss. Akad. Wiss; C.A. Vol. 14, Part 1 p. 642; Attempts are made to find a practical use of the effect of furfural condensed with phenol.

New developments in furan resins—John Delmonte; Modern Plastics Feb., 1944, 8-10, 65; Use in laminates discussed; C.A. Vol. 38, pg. 5022.

Polymerization & structure of furfural resins—W. S. Penn; Brit. Plastics 16, 286-92 (1944); C.A. Vol. 38, pg. 6006.

Paper base laminates—T. A. Howells, H. F. Lewis; Ind. & Eng. Chem. 37, 264-8 (1945); Review of development of low pressure laminates, comparative data on laminates with phenolic, furane, allymer, melamine, urea and vinylite; C.A. Vol. 39, pg. 1781.

Furan resins—A. J. Norton; Ind. Eng. Chem. 40, 236-8 (1948); A review of the use of furfural and its derivatives for preparing resins. Reaction of furfural with phenol, cresol, resorcinol, urea, melamine, ketones and amines are discussed; C.A. Vol. 42, pg. 2812.

I. THERMOPLASTIC

Composite sheets containing cellulose derivatives—Wolff & Co. and R. Weingand; Brit. 304,722, January 25, 1928; C.A. Vol. 23, 4819[1].

Uniting layers of cloth by use of Cellulose Nitrate and a thermoplastic resin—R. W. Sexton; U.S. 1,926,918, Sept. 12; C.A. Vol. 27, 5990[6]; Treats textiles with C. N. cement and a compound thermoplastic resin unites with heat and pressure.

Laminated phonograph records—Richard F. Warren (to Carbide and Carbon Chemicals Corp.); U.S. 2,028,126, Jan. 14, 1936; C.A. Vol. 30, 1472; Describes a laminate with a resinous constituent of a polymerization product from a vinyl lower aliphatic acid ester.

Molded compound sheet material—Lygos Proprietary Ltd.; Australian 21, 391/35, Feb. 27, 1936; C.A. Vol. 30, 6476; Thin compressible reinforcing sheets are sandwiched between layers of a comp'n comprising fusible powdered resin or cellulose acetate and then subjected to heat and pressure.

Compound sheet material—Frank J. Farrel; Brit. 462,726, Mar. 11, 1937; C.A. Vol. 31, 5907; Describes a laminate of flexible material with a binder of benzyl cellulose, which may be further plasticized.

Compound sheet material—British Celanese Ltd.; Brit. 174,696, Nov. 5, 1937; C.A. Vol. 32, 3524; A laminate formed from preformed flexible sheets with reinforcing members disposed between them and one or more intermediate layers comprising an org. cellulose derivative.

Aqueous emulsions of cellulose derivatives—E. I. duPont deNemours & Co.; Brit. 477,997, Jan. 10, 1938; C.A. Vol. 32, 4698; Describes an emulsion which may be used to coat paper, fabric, etc. to make laminated articles.

Impregnated paper, fabric, etc.—Michael W. Perrin, John G. Paton, Edmund G. Williams and Imperial Chemical Industries Ltd.; Brit. 491,804, Sept. 8, 1938; C.A. Vol. 33, 1067; Paper, fabric, etc. are coated with a solid polymer of ethylene by various methods and laminated materials may be prepd. from the coated materials.

Molded laminated products—Henry W. H. Warren and Reginald Newbound (to Canadian Gen. Electric Co. Ltd.); Can. 376,832, Oct. 4, 1938; C.A. Vol. 33, 1836; Describes a polystyrene laminate.

Impregnating paper, etc. with ethylene polymers—Imperial Chemical Industries Ltd.; Fr. 834,990, Dec. 8, 1938; See Brit. 491,804 (C.A. Vol. 33, 1067); C.A. Vol. 33, 4788.

Laminated fibrous products—Firma Carl Freudenberg. (Carl Ludwig Nottebohm, inventor); Ger. 677,181, June 21 1939; C.A. Vol. 33, 6990; A thin fleece of tangled fiber is impregnated with a soln. or emulsion of a thermoplastic resin, e.g., a polymerized vinyl comp'd. and secured by compression to another surface.

Laminated plastic—A. I. Abramov; Russ. 52, 331, Dec. 12, 1937; C.A. Vol. 34, 3844; Sheets of paper are treated with a nitro varnish and pressed together at 135-40°.

Laminating sheet materials such as those of cellulose with urea-formaldehyde resin—Oskar R. Ludwig (to Rohm & Haas Co.); U.S. 2,187,383, Jan. 16, 1940; C.A. Vol. 34, 3402; Describes a laminate in which the sheet material is impregnated with an aq. emulsion of polymerized methyl acrylate before impregnation with the urea-resin.

Laminated products suitable for electrical insulation—A. Runyan (to Continental-Diamond Fibre Co.); U.S. 2,224,523, Dec. 10, 1940; C.A. Vol. 35, pg. 2248; Mica flakes and a binder of ethyl cellulose etc.

Laminated materials for various uses—D. E. Edgar (to E. I. duPont deNemours & Co.); U.S. 2,234,236 Mar. 11; C.A. Vol. 35, pg. 3744; Layers of cloth etc. are joined by a film of thermoplastic cement comprising cellulose nitrate and a polyhydric alc-polybasic and resin, etc.

Laminated materials—H. Standinger & P. Coppock (to the Distillers Co. Ltd.); Brit. 512,942, Dec. 19, 1939; C.A. Vol. 35, pg. 6028; Wood is impregnated with polystyrene in benzene and subjected to heat and pressure.

Laminated wood structure—A. Lang; Brit. 525,556, Aug. 30, 1940; C.A. Vol. 35, pg. 6702.

Plastics from silk—T. Suzuki & K. Komatu (Japan-134,344) Jan. 25, 1940; C.A. Vol. 35, pg. 7581; Silk is heated and cooled under pressure.

Adhesive compositions suitable for laminating paper, and veneers, etc.—E. C. Pitman (to E. I. duPont deNemours & Co.); U.S. Pat. 2,223,575, Dec. 3, 1940; C.A. Vol. 35 pg. 1901.

Laminated sheet material—Archibald Renfrew and William E. F. Gates (to Imperial Chemical Industries Ltd.); U.S. 2,199,597, May 7, 1940; C.A. Vol. 34, 5969; Describes a laminate with an ester of methacrylic acid as the binding material.

Laminated electric insulators—The Bushing Co. Ltd. and Wm. J. Brown; Brit. 522,553, June 20, 1940; Layers of paper impregnated or coated with polystyrene resin are bonded together; C.A. Vol. 36, pg. 855.

Laminated structures—N. A. DeBruyne; Brit. 544,873, April 30, 1942; C.A. Vol. 36, pg. 7192; The non-metallic material comprises cellulose acetate and the metallic sheet is stainless steel.

Modified vinyl plastic compositions suitable for use as interlayers in laminated glass—Brock J. Deninson (to Pittsburgh Plate Glass Co.); U.S. 2,322,571, June 22; C.A. Vol. 38, pg. 184.

Composite material for use in the manfacture of furniture and the like—Camille Dreyfus; U.S. 2,325,669, Aug. 3; Cellulose acetate laminated to wood, etc.; C.A. Vol. 38, pg. 437.

Composite material for use in the manufacture of vehicle bodies or the like—Camille Dreyfus; U.S. Pat. 2,325,668, Aug. 3; Cellulose acetate laminated to steel etc.; C.A. Vol. 38, pg. 437.

Bonded electrical insulating material—M. J. Cradick; Metropolitan Vickers Electrical Co. Ltd.; Brit. Pat. 550,760, Jan. 22, 1943; C.A. Vol. 38, pg. 1587.

Laminated structures—E. L. Vidal (to Vidal Corp.); Can. Pat. 418, 767; C.A. Vol. 38, pg. 3058.

Ribbed roof structure for laminated artificial material—E. Komenda; U.S. Pat. 2,347,566 April 25, 1944; C.A. Vol. 39, pg. 228.

Molding products such as those of a fabric impregnated with an ethylcellulose composition—Z. T. Walter; U.S. Pat. 2,356,902, Aug. 29, 1944; C.A. Vol. 39, pg. 441.

Paper-base laminates—T. A. Howells, H. F. Lewis; Ind. & Eng. Chem. 37, 264-8 (1945); Review of development of low pressure laminates, comparative data on laminates with phenolic, furane, allymer, melamine, urea and vinylite; C.A. Vol. 39, pg. 1781.

Cellulose compounds in thermoplastic laminates—C. W. Eurenius & R. H. Heht etc. (Hercules Powder Co.); Ind. Eng. Chem. 37, 949-63 (1945); Laminates with various cloths, cellulose acetate etc.; C.A. Vol. 40, pg. 239.

Alkyd-vinyl insulation proves its worth—E. L. Schulman (Westinghouse Electric Corp.); Plastics (Chicago) 8, No. 1; C.A. Vol. 42, pg. 3211; A laminate made of asbestos impregnated with an alkyd vinyl resin replaces Mica as insulation for commutator bars. A table compares the phys. & elec. properties of Micarta 8564 insulation with those of Mica.

Thermoplastic laminates—E. R. Perry (Westinghouse); Plastics & Resins 5,, No. 7, 11-12, 31 (1946); C.A. Vol. 41, pg. 2603; Descriptive.

Laminates from purified cotton linters sheet—M. Gallagher and R. Seymour (Univ. of Chat-

tanooga); Modern Plastics 25, No. 12, 117-19, 171-3 (1948); C.A. Vol. 42, pg. 8020; Laminates were made from chem/cotton sheets impreg. with polyester, phenolic, and thermoplastic resins. Rockwell hardness M, water absorption and mechanical properties of the various laminates were tabulated.

I. MISCELLANEOUS

Phenol-Formaldehyde Condensation Products using Casein as a Contact Material—H. Kuhl; Chem. Ind. Vol. 37, p. 559; C.A. Vol. 9, Part 1, p. 971; The Casein acts as a contact substance in about the same manner as the alkalies.

Resins and their Chemical Relations to Terpenes—G. B. Frankforter; Science, Vol. 36, p. 257; C.A. Vol. 7, Part 2, p. 2482; Concludes that resins may be formed from aldehydes but more likely from terpenes.

Laminated paper product containing a synthetic hydrocarbon resin—Carlton Ellis (to Standard Oil Development Co.); U.S. 2,042,299, May 26, 1936; C.A. Vol. 30, 4954.

Composite laminated panel material—Carl W. Krause (to Wilson & Co.); U.S. 2,095,706, Oct. 12, 1937; C.A. Vol. 31, 8761; Describes a fabric laminate with a blood binder and a surface layer of fabric impregnated with a synthetic resin.

Laminated sheet material suitable for panels, etc.—Adrian A. Robinson (to Wilson & Co.); U.S. 2,105,268, Jan. 11, 1938; C.A. Vol. 32, 2254; Describes a paper or cloth laminate which is bound together with sol. blood and a synthetic resin.

New synthetic resin from the condensation of pyridine bases with formaldehyde—Y. A. Shmidt; Org. Chm. Ind. (U.S.S.R.) 5, 339-43 (1938); C.A. Vol. 33, 266; Discusses the preparation of the resin with some remarks on molding and laminating properties.

Adhesive compositions suitable for laminating paper, and veneers, etc.—E. C. Pitman (to E. I. duPont deNemours & Co.); U.S. Pat. 2,223,575, Dec. 3, 1940; C.A. Vol. 35, pg. 1901.

Effect of additions of low-cost petroleum resins to phenol-formaldehyde laminating resins—A. Friedman; Plastics Trends 2, No. 10, 5-6 (1942); C.A. Vol. 37, pg.198.

Compositions suitable for use as adhesives in laminating papers and for other purposes—U. R. Pike, P. H. Kelm, G. A. McLaren, Jr. (to Applied Sugar Labs. Inc.); U.S. Pat. 2,322,736, June 22; C.A. Vol. 38, pg. 188.

Impregnated material—J. Burns, Ltd.; Brit. Pat. 549,615, Nov. 30, 1942; C.A. Vol. 38, pg. 820.

Plastic products—W. L. Rust & D. M. Musser (to Glenn L. Martin Co.); U.S. 2,371,313, March 13, 1945; Plastic of cotton fibers and water soluble resin; C.A. Vol. 39, pg. 4522.

Binder for laminated products—Bakelite Ltd.; Brit. 559,684, March 1, 1944; The condensate in product of an alkyl-substituted phenol with an aldehyde in the presence of a basic catalyst is plasticized with an alkyl ester of abietic acid in the amount of 10-30% of the compn.; C.A. Vol. 40, pg. 502.

Bagasse base resins for the plastics industry—J. B. Molitor; Ind. Plastics 2, No. 1, 30-1 (1946); C.A. Vol. 40, pg. 4909; Description of physical properties of laminates with above resins.

Data on low-pressure laminating resins—Modern Plastics 23, No. 10, 144-5 (1946); C.A. Vol. 40, pg. 5289.

Cashew nut shells in resins for laminates & cements, etc.—Synthetics & By-products 8, 411-13 (1946); C.A. Vol. 41, pg. 2601.

Resin-impregnated fibrous laminate—K. Fredrick etc. (to Firestone Tire & Rubber Co.); U.S. 2,424,923; C.A. Vol. 42, pg. 413; Laminates from a fibrous material and urea-formaldehyde condensate and a butadiene-styrene-copolymer.

Artificial resin and method of coating paper therewith—E. Cohnhoff; U.S. 2,428,358; Oct. 7, 1947; A colloidal resin is prepared with the use of tannin and this resin may be used for coating paper, textile etc.; C.A. Vol. 42, pg. 791.

Paper plastics products—C. C. Sachs Pacific Pulp & Paper Ind. 18, No. 3, 44, 46, 48, 50-1 (1944) C. A. Vol. 38, pg. 5614 Types of plastics & resins available etc.

Mfg. and Use of Artificially Hardened Resins—O. Prager; Seifenseider-Ztg. Vol. 62, p. 686; C. A. Vol. 9, Part 3, p. 3369; Methods of hardening resins: Distill farther, remelting and cool; uses of air, oxides of metals and the uses of this hardened product.

Synthetic Resins—R. Eller; Kunstoffe, Vol. 6, p. 45; C.A. Vol. 10, Part 1, p. 1277; A review of the patented processes for the condensation products.

Plastic Chemistry in the electrical field—W. C. Goggin & R. F. Boyer Plastics & Resins 3, No. 11, 6-12, 29-33, 36 (1944); A review of effect of chem-structure on electrical properties mech. properties, etc.; C.A. Vol. 39, pg. 641.

Plastics, resins and rubbers—Paul O Powers. Chem. Eng. News 24, 2784-8 (1946); C.A. Vol. 41, pg. 309; A table listing plastics, resins, synthetic rubbers etc., giving structures, raw materials & reactions for production.

II APPLICATIONS

II. GEARS

Gear blanks of fibrous material and phenolic condensation products—L. T. Frederick; U.S. 1,636,411, July 19, 1927; C.A. Vol. 21, 2965[9].

Laminated material for composite gears—Emile M. d'Aubigne (to Continental-Diamond Fibre Co.); U.S. 1,981,782, Nov. 20, 1934; C.A. Vol. 29, 526; Description of helical gears formed with a rim portion of laminated stock, such as canvas together with a resinous compn.

Fiber gears—Frank H. Benge (to Continental Diamond Fibre Co.); U.S. 2,064,144, Dec. 15, 1936; C.A. Vol. 31, 790; Describes a rim portion of a gear formed of fibrous laminations.

Gears of compressed-impregnated materials—M. Kraemer; Kunstoffe 31, 85-7 (1941) C.A. Vol. 35, pg. 4870; Discusses gears made with canvas and wood laminates.

II. DECORATIVE

Laminated material comprising phenolic condensation products—C. M. Hargrave; U.S. 1,636,411, July 5, 1927; C.A. Vol. 21, 2993[3]; Decorative phenolic laminate—process of manufacture patent.

Gear blanks and gears formed of fabric and phenol-formaldehyde condensation products—L. T. Frederick; U.S. 1,663,477, March 20, 1928; C.A. Vol. 22, 1659[2].

Ornamenting plywood with paper impregnated with synthetic resin—Int'l General Electric Company; Brit. 308,739, March 27, 1928; Marbles and Wood Patterns; C.A. Vol. 24, 483[3].

Composite sheets containing cellulose derivatives—Wolff & Co. and R. Weingand; Brit. 304, 722, January 25, 1928; C.A. Vol. 23, 4819[1].

Uniting layers of fabrics with synthetic resins or the like—H. Rommler A.-G.; Brit. 318,489, Sept. 3, 1928; Fabric Base Laminates—Decorative phenolic; C.A. Vol. 24, 2310[1].

Laminated material suitable for imitation of various woods W. W. Carter, Jr.—Formica—U.S. 1,956,314, April 24; C.A. Vol. 28, 4202[3]; Barrier Sheet.

Laminated material suitable for simulating hand-rubbed woods—Wm. E. Gwaltney (to Westinghouse Elec. & Mfg. Co.); U.S. 1,991,090, Feb. 12, 1935; C.A. Vol. 29, 2264.

Laminated products with a surface layer containing synthetic resin—John D. Cochrane, Jr. (to Formica Insulation Co.); U.S. 1,997,358, April 9, 1935; C.A. Vol. 29, 3749.;U.S. 1,997,359 also relates to the production of a laminated product suitable for decorative panels etc.

Laminated articles—Dynamit-Act.-bes. vorm; Alfred Nobel & Co.; Brit. 417,011, Sept. 26, 1934; See Fr. 764,240; C.A. Vol. 29, 1181.

Laminated material suitable for decorative panels, etc.—Charles A. Page (to Westinghouse Elec. & Mfg. Co.); U.S. 2,011,648, Aug. 20, 1935; C.A. Vol. 29, 6671.

Transferring designs, etc.—Bakelite Corp. Brit. 432,408, July 29, 1935; C.A. Vol. 30, 547; Describes transfer of a design onto a paper laminate.

Resin plastics and color—H. Jones; Trans. Inst. Plastics Ind. 5, No. 9, 24-46; C.A. Vol. 30, 3905; Methods of compounding resins, laminated materials, and coloring matter used with plastics and their properties.

Laminated products with a surface layer containing synthetic resin—The Formica Insulation Co.; Brit. 440,578, Jan. 2, 1936; C.A. Vol. 30, 3909; Describes a heat-resistant comp'd sheet material for table or counter tops, etc.

Compound sheet material—Soc. pour L'ind. Chim. a Bale; British 443,449, Feb. 28, 1936; Describes a decorative laminate using a urea resin as the binder; C.A. Vol. 30, 5332.

Molded laminated product—Gerald H. Mains (to Canadian Westinghouse Co. Ltd.); Can. 358,515, June 16, 1936; C.A. Vol. 30, 5687; Describes a decorative laminate.

Decorative sheet materials—Geo. C. Tyce, Victor Lefebure and Imperial Chemical Industries Ltd.; C.A. Vol. 31, 1124; Describes a compound sheet material made by superimposing a resin impregnated sheet upon a layer of unimpregnated decorative or printed paper.

Laminated plastics for decorative uses—W. G. Steiner; Modern Plastics 14, No. 2, 263, 238, 240, 242, 244; C.A. Vol. 31, 5897.

Synthetic resinoids—H. V. Potter; Chemists and Druggists 126, 176 (1937) C.A. Vol. 31, 8064; A review of discovery and uses of phenolic and urea resinoids, laminated products, alkyd resinoids and org. glass.

Tolerances of bushings from pressed (artificial plastic) materials—G. Barner; Kunstoffe 27, 324-6 (1937) C.A. Vol. 32, 5101.

Laminated refrigerator strip insulation—Geo. Alexander (to General Electric Co.); U.S. 2,218,373, Oct. 15, 1941; C.A. Vol. 35, pg. 1147; Description of process for making breaker strips, etc.

Decorative plastics for automobiles—W. J. McCortney; Ind. Eng. Chem. 33, 237-9 (1941); C.A. Vol. 35, pg. 1892.

Colored plastic laminates—R. C. Eisele; Plastics & Resins Industry 3, No. 2, 7-8 (1944); C.A. Vol. 38, pg. 3042.

Paper and the plastics industry II-protective and decorative surfacing—William B. Darling; Ind. Plastics 1, No. 6, 22-5 (1945); C.A. Vol. 40, pg. 1058.

II. TUBING AND ROD

Composite cylindrical articles such as tubes or rods of paper or cloth and synthetic resin, etc.—Frank H. Benge (to Continental Diamond Fibre Co.); U.S. 1,996,741, April 9, 1935; C.A. Vol. 29, 3422; Description of details of manipulation and heat treatment.

Forming tubes and rods from fibrous material such as paper or cloth and a resinous binder—Gustave E. Landt (to Continental Diamond Fibre Co.); U.S. 2,001,031, May 14, 1935;

C.A. Vol. 29, 4486; Various operative details are described.

Rigid tubes of heat-hardened resinous material—Arthur Lloyd (to Bakelite Ltd.); U.S. 2,059,373, Nov. 3, 1936; C.A. Vol. 31, 481; Describes details of manufacture of laminated tubing.

Phenol-formaldehyde rods and tubes for electrical purposes—E. E. Halls; Plastics (Brit.) 4, 13-14 (1940); C.A. Vol. 34, 2492; Heat losses and water absorption values are given for various grades and sizes.

Treating hollow paper tubes, as of superposed wound laminations—W. F. Stahl; U.S. Pat. 2,343,096, Feb. 29, 1944; App. and details for treating tube with resins and then molding in a mold or die; C.A. Vol. 38, pg. 5030.

II. ELECTRICAL

Laminated material—V. H. Turkington (Bakelite); Can. 306,935, Dec. 23, 1930; C.A. Vol. 25, 786[7]; Thermosetting laminate suitable for electricial insulation, manufacture and product.

The characteristics of sheets of phenolic plastics for electro-chemical uses—E. Purgotti; Materie Plastiche 3, 19-22 (1936); C.A. Vol. 30, 6473.

Sheets of cellulose material impregnated with synthetic resin and suitable for electrical insulation, etc.—Peter Pinten (to Dynamit-A-G vorm. Alfred Nobel & Co.); U.S. 2,054,444, Sept. 15, 1936; C.A. Vol. 30, 7726; A water-soluble phenolic resin is used to impregnate paper and a laminate is built up of these sheets.

Laminated sheets suitable for electrical insulation, etc.—Kurt Ripper; U.S. 2,066,421, Jan. 5, 1937; C.A. Vol. 31, 1119; Describe a laminate of paper, linen, or asbestos, bound together with a thiourea formaldehyde resin.

Phenolic resin laminated material as an electrical insulator—Shunzo Sugimoto and Shoichi Matsumura; Repts. Imp. Ind. Research Inst. Osaka (Japan) 17, No. 8, 1-27 (1936); C.A. Vol. 31, 6762; Effect of variation in the mode of manuf. upon the elec. properties was studied.

Laminated sheet for electrical purposes—E. E. Halls; Plastics 2, 306-9 (1938); C.A. Vol. 32, 8037.

(Resin impregnated) laminated paper and laminated fabric (products)—H. Hese; Kunstoffe 28, 59 (1938); C.A. Vol. 32, 9333; Staple rayon in place of cotton fabric produced an improvement in elec. properties and moisture resistance.

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Laminated products suitable for electrical insulation—A. Runyan (to Continental Diamond Fibre Co.); U.S. 2,224,523, Dec. 10, 1940; C.A. Vol. 35, pg. 2248; Mica flakes and a binder of ethyl cellulose etc.

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III FABRICATION AND FINISHING

III. ADHESIVES AND BONDING

Compound sheet material—Arnost Fischer; Brit. 495,917, Nov. 22, 1938; C.A. Vol. 33, 3036; Describes the make-up of a synthetic resin laminate with surfaces suitable for attachment to other articles.

The use of plastics in aircraft—E. P. King; Aircraft Eng. 11, 96-100 (1939); C.A. Vol. 33, 5540; Mech. tests of laminated materials and spliced joints are reported.

Laminated fibrous products—Firma Carl Freudenberg; (Carl Ludwig Nottebohm, inventor); Ger. 677,181, June 21, 1939; C.A. Vol. 33, 6990; A thin fleece of tangled fiber is impregnated with a soln. or emulsion of a thermoplastic resin, e.g., a polymerized vinyl comp'd and secured by compression to another surface.

Use of artificial resins in airplane construction—I. Strength of artificial resin products; W. Kuch; Kunstoffe 28, 202-8 (1938); II. Possibilities of glueing together laminated products and airplane parts from pressed materials; Ibid 262-7; C.A. Vol. 33, 9481.

Laminated structures—N. A. DeBruyne; Brit. 544,845, April 30, 1942; C.A. Vol. 36, pg. 7192; Article of a fabric etc. impregnated with a phenolic resin to which a skin consisting of a metallic sheet is secured by mechanical bonding.

How to bond plastics—Mel Meyers; Plastics (Chicago) 2, No. 5, 64-5, 68, 70, 73, 145-7 (1945); Suitable methods for various types of plastics; C.A. Vol. 39, pg. 2905.

Cashew nut shells in resins for laminates & cements, etc—Synthetics & By-products 8, 411-13 (1946); C.A. Vol. 41, pg. 2601.

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Laminated material formed of paper or the like and resin substances—H. F. Horne to Westinghouse Electric and Mfg.; U.S. 1,953,-111, April 3, C.A. Vol. 28, 3921[4]; Pigmented surfaced laminate.

Laminated material suitable for simulating hand-rubbed woods—Wm. E. Gwaltney (to Westinghouse Elec. & Mfg. Co.); U.S. 1,991,090, Feb. 12, 1935; C.A. Vol. 29, 2264.

Transferring designs, etc.—Bakelite Corp.; Brit. 432,408, July 29, 1935; C.A. Vol. 30, 547; Describes transfer of a design onto a paper laminate.

Flexible veneers with enamel-like surface—John F. Dreyer (to Formica Insulation Co.); U.S. 2,062,088, Nov. 24, 1936; C.A. Vol. 31, 789; Describes a thin laminate made up with uren, phenolic and polymerized vinyl chloride resins.

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Spray-coating surfaces such as those of laminated board—Arthur M. Howald and Leonard S. Meyer (to Plaskon Co. Inc.); U.S. 2,178,358, Oct. 31, 1939; C.A. Vol. 34, 1420; Finely divided particles of pulp or paper impregnated with a urea-formaldehyde resin are suspended in a non-solvent such as water and used for spray coating. Coating is finished by hot pressing.

Plastic-impregnated fibrous materials—C. D. Philippe (to Union Carbide & Carbon Corp.); Can. 407,159, Sept. 1, 1942; C.A. Vol. 36, pg. 6707; Operative and structural details are described for an apparatus for impregnating fibrous materials suitable for making airplane propeller blades.

Laminated structures—N. A. DeBruyne; Brit. 544,845, April 30, 1942; C.A. Vol. 36, pg. 7192; Article of a fabric etc. impregnated with a phenolic resin to which a skin consisting of a metallic sheet is secured by mechanical bonding.

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Difficulties in coating plastics—M. Hess; Verfkronick 20, 167 (1947); C.A. Vol. 41, pg. 7812; Discusses preparation of surface and methods of applying coatings, etc.

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Resinous laminated sheet material suitable for radio dials, etc.—Wesley R. Thompson and Wm. E. Flood (to Catalin Corp. of America); U.S. 2,185,477, Jan. 2, 1940; C.A. Vol. 34, 2964; Describes a non-brittle laminate which can be stamped or punched without fracturing.

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Phenolic sheet material—A. S. Peterson, W. I. Beach & R. L. Whaun; Can. 437,043, Sept. 17, 1946; Post-forming patent.

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Resinous composition suitable for use in the manufacture of laminated material to be punched—G. Alexander (to General Electric Co.); U.S. 2,267,390, Dec. 23, 1941; C.A. Vol. 36, pg. 2647.

Machining of phenolic laminates—S. A. Rulon; Tool & Die J. 8, No. 7, 94-6, 142-6 (1942); Descriptive; C.A. Vol. 37, pg. 697.

Laminated material suitable for electrical insulation, brake and clutch linings etc—M. T. Harvey (to the Harvel Corp.); U.S. 2,314,701, March 23, 1943; C.A. Vol. 37, pg. 5167; A punching stock is described made from paper or cloth and a resin using phenol and cardanol and HCHO.

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Surfacing articles with synthetic resin veneers—Arthur S. Lewenstein and Plyrock Ltd.; Brit. 488,785, July 13, 1938 Addn. to 401,391; C.A. Vol. 33, 275.

Laminated sheet materials—Dynamit-Actien-Gesellschaft vormals Alfred Nobel & Co.; Brit. 488,911, July 15, 1938; C.A. Vol. 33, 285; Webs of fibrous material or fabric are layered with wood veneers and pressed. The webs being so highly impregnated with a synthetic resin that a smooth surface results.

Decorative laminated sheet material—S. B. Collins; U.S. 2,295,028, Sept. 28, 1942; C.A. Vol. 37, pg. 979.

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Wood-cloth and wood-paper laminates—John Delmonte; Brit. Plastics, 17, 341-8 (1945); C.A. Vol. 39, pg. 5549; Use of canvas or paper overlays with plywood etc.

Laminates and overlays—D. V. Redfern (Adhesives Products Co.); Pulp & Paper Ind. 20, No. 1, 48, 50 (1946); C.A. Vol. 40, pg. 4249; High and low pressure laminates, overlays, etc.

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Metal coating of plastics—R. Karabinas, Wisconsin Engr. 51, No. 7, 12, 22 (1947); C.A. Vol. 41, pg. 7812.

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Choice of plastic materials as affected by fabrication—H. C. Hillman; Prod. Eng. 13, 585-7 (1942); C.A. Vol. 37, pg. 197.

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IV FILLERS

IV. RAYON

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Optical investigation of pressed artificial resins—W. Weigel; Kunstoffe 28, 5-8 (1938); C.A. Vol. 32, 5102.

(Resin impregnated) laminated paper and laminated fabric (products)— H. Hese; Kunstoffe 28, 59 (1938); C.A. Vol. 32, 9333; Staple rayon in place of cotton fabric produced an improvement in elec. properties and moisture resistance.

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Laminated sheet material containing synthetic resins—Bakel Corp.; Brit. 300,836, February 10, 1928; C.A. Vol. 23, 4090[4]; Paper or cloth impregnated with glycerol-phthalate type resins and the sheets are bonded with a phenolic resin.

Ornamenting plywood with paper impregnated with synthetic resin—Int'l General Electric Company; Brit. 308,739, March 27, 1928; Marbles and Wood Patterns; C.A. Vol. 24, 483[3].

Paper products containing synthetic resins—E. E. Novotny (to J. E. Stokes); U.S. 1,771,-138, July 22; (Electrical insulation); C.A. Vol. 24, 4564[3].

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Laminated products containing phenolic resin—H. L. Bender to Bakelite; U.S. 1,944,143, January 16; C.A. Vol. 28, 2137[7]; Paper-Base-Surface sheet treated with free phenol free resin.

Composite sheet material—A. S. Lewenstein; Brit. 401,391, November 16, 1933; C.A. Vol. 28, 2481[6]; Surfaced plywood—paper or cloth.

Laminated material formed of paper or the like and resin substances—H. F. Horne to Westinghouse Electric and Mfg; U.S. 1,953,111, April 3,; C.A. Vol. 28, 3921[4].; Pigmented surfaced laminate.

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Flexible laminated sound records—Samuel Whyte (to Radio Corp. of America); U.S. 1,997,398, April 9, 1935; C.A. Vol. 29, 3750; Describes a laminate with a core of paper impregnated with urea-formaldehyde resin with a surface of a cellulose ester.

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Production of absorbent paper of the American type "Gee" for making laminated insulation boards—A. Laube and Z. Gruzdeva; Tzentral Nauch.-Issledovatel. Inst. Bumazhoni Prom. Material. 1934, No. 4, 178-93; C.A. Vol. 29, 8326.

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Thermoplastic resins from aniline condensation products—Karl Frey; Kunstoffe 25, 305-8 (1935); C.A. Vol. 30, 1147; Chemistry and properties of the resin and products made from them, e.g., impregnated paper.

Impregnating paper with resinous binders—Gerald H. Mains (to Canadian Westinghouse Co. Ltd.); Can. 357,298, Apr. 21, 1936; C.A. Vol. 30, 4008; Describes impregnating paper with a urea or thiourea resin up to 30-40%.

Laminated paper product containing a synthetic hydrocarbon resin—Carlton Ellis (to Standard Oil Development Co.); U.S. 2,042,299, May 26, 1936; C.A. Vol. 30, 4954.

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Urea-formaldehyde resins and compositions—Bakelite Ltd.; Brit. 449,898, July 2, 1936; C.A. Vol. 30, 8436; Paper impregnated with these resins may be built up into laminated articles.

Sheets of cellulosic material impregnated with synthetic resin and suitable for electrical insulation, etc.—Peter Pinten (to Dynamit-A-G vorm. Alfred Nobel & Co.); U.S. 2,054,444, Sept. 15, 1936; C.A. Vol. 30, 7726; A water-

soluble phenolic resin is used to impregnate paper and a laminate is built up of these sheets.

Laminated sheets for electrical insulation, etc.—Kurt Ripper, U.S. 2,066,421, Jan. 5, 1937; C.A. Vol. 31, 1119; Describes a laminate of paper, linen, or asbestos, bound together with a thiourea formaldehyde resin.

Cellulosic materials—The British Thomson-Houston Co. Ltd.; British 452,540, August 25, 1936; C.A. Vol. 31, 1123; Describes molded and laminated materials made from bagasse, sawdust, cornstalks, etc.

Laminated boards—Gilbert T. Morgan and Norman J. L. Megson; Brit. 465,411, May 4, 1937; C.A. Vol. 31, 7151; Describes the treating of paper with materials required for forming a phenol-formaldehyde resin, the sheets are piled, pressed, and heated to form an insoluble, infusible resin in a single operation.

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Paper for plastics—H. J. Holtz & L. J. Beaulien; Ind. Plastics, 1, No. 10, 19, 30 (1946); C.A. Vol. 40, pg. 3298.

Lignin-filled laminated-paper plastics—U.S. Forest Products Lab. etc.; Paper Trade J. 122, No. 14, 35-42; C.A. Vol. 40, pg. 3642-43.

Paper-base laminates—E. S. Bauer; Pulp Paper Mag. Can. 47, No. 6, 75-7 (1946); General Review; C.A. Vol. 40, pg. 4913.

Structural-type paper base laminates. Their properties and characteristics—C. F. Marschner; Pacific Plastics Mag. 4, No. 4, 38, 40, 42-3 (1946); C.A. Vol. 40, pg. 4913.

Paper & the plastics industry—Formed and molded items—Wm. B. Darling; Ind. Plastics 2, No. 2, 28-30, 36 (1946); C.A. Vol. 40, pg. 5291.

Production of resin-impregnated paper-pulp preforms—H. C. Martin; Plastics 8, 520-9 (1944); C.A. Vol. 40, pg. 6291.

Present and future technical developments in wood and in paper-base plastics and lignoplastics—Am. Matagrin; Papeterie 68, 39-43, 70-73, 106-7, 109-110 (1946); C.A. Vol. 41, pg. 857; A resume.

Manufacture of laminates in Germany—G. M. Kline & Mrs. E. Callomon; Modern Plastics 24, No. 2, 147-9, 208-10 (1946); C.A. Vol. 41, pg. 2602; A review from Dept. of Commerce Report PB-33273 covering paper & fabric-base laminates.

Paper and the plastics industry—A review of applications and post-war potential uses—W. B. Darling; Ind. Plastics 2, No. 10, 18-22 (1947); C.A. Vol. 41, pg. 3998; Descriptive.

Methods for combining phenolic resins and paper—E. Bauer; Paper Trade J. 125, No. 3, 502 (1947); C.A. Vol. 41, pg. 5749; Off-machine, wet webs, and beater addn. methods of combining phenolic resins and paper are described. Data for costs, grades available & applications are discussed.

Paper for plastic laminates—J. C. Pitzer (the Formica Co.); Paper Trade J. 125, No. 4, 49-51 (1947); C.A. Vol. 41, pg. 5750; A general discussion is given of papers used and their properties, together with the applications of paper-base laminates.

Paper for use in plastic laminates—J. C. Pitzer; Am. Paper Converter 21, No. 9, 14-15, 21 (1947); C.A. Vol. 41, pg. 7812.

Plastics testing in the paper-mill laboratory—J. C. Parsell (J. P. Lewis Co.); Paper Trade J. 126, No. 16, 55-7 (1948); C.A. Vol. 42, pg. 4389; The use of resins for wet-strength coated, impregnated and laminated papers, and their beater and machine addition is discussed.

Causes of dimensional instability of paper-base phenolic resin laminates on total immersion in water—C. J. Straka (Westinghouse Elec. Corp.); Paper Trade J. 126, No. 14, 50-4 (1948); C.A. Vol. 42, pg. 4389; By means of curves, the effect of nature of the resin, the type of paper and the method of treating and molding the laminate on the dimensional stability is shown.

Phenol resin. The resin from hexamethylenetetraminetri-phenol—T. Miyoshi; J. Soc. Chem. Ind. Japan; Insulating products are obtained from above resin; C.A. Vol. 42, pg. 6154.

Laminates from purified cotton linters sheets—M. Gallagher and R. Seymour (Univ. of Chattanooga); Modern Plastics 25, No. 12, 117-18, 171-3, (1948); C.A. Vol. 42, pg. 8020; Laminates were made from chem. cotton sheets impreg. with polyester, phenolic and thermoplastic resins. Rockwell hardness M, water absorption.

The swelling of reinforced plastics—F. T. Barwell and K. W. Pepper; Trans. Farady Soc. 42B, 275-82; C.A. Vol. 42, pg. 8519; Discusses causes for swelling of laminates, etc.

IV. GLASS

Electrical insulation of fibrous glass—E. B. Shaud and J. F. Hyde (to Owens Corning Fiberglas Corp.); U.S. 2,209,850, July 30, 1941; Composition of glass cloth and synthetic resin; C.A. Vol. 35 (1941); pg. 234.

Fiberglas-plastic combinations—T. S. Rogers; Modern Plastics 18, No. 11, 69-70, 96, 98 (1941); A review of industrial applications; C.A. Vol. 35, pg. 7578.

Loss of strength of laminates on prolonged beating—M. Azam; Plastics Trends 2, 7-8 (1942); C.A. Vol. 36, pg. 5283; Data for impact strength of laminates of muslin and glass cloth with phenolic resin for one week at 300°F.

Physical properties of fiberglas laminated plastics—C. W. Armstrong; Iron Age 152, No. 4, 51-4 (1943); C.A. Vol. 37, pg. 5512.

Pressed products of synthetic resins. Allgemeine Elektricitats—Gessellschaft; Ger. 728-757, Nov. 5, 1942; Products of glass wool and resins; C.A. Vol. 38, pg. 430.

Laminated materials—American Cyanamid Co.; Brit. Pat. 551,127, Feb. 9, 1943; C.A. Vol. 38, pg. 1822.

Significance of new data on combinations of plastics & glass fibers—F. W. Preston; Glass Ind. 25, 266-7, 284, 287 (1944); C.A. Vol. 38, pg. 4063.

Large molding techniques—T. S. Carswell; Plastics & Resins 3, No. 10, 10-14, 29-31, 36 (1944); Various procedures described, properties of glass cloth laminates, etc.; C.A. Vol. 39, pg. 643.

Increasing the compressive strength of fiberglas reinforced plastics—G. Slaytor; Ohio State University Eng. Expt. Station News 16, No. 4, 3-8 (1944); C.A. Vol. 39, pg. 1082.

Phenolic resin reinforced with glass fibers—R. W. Auxier (to Can. Westinghouse); Can. 425,665, Feb. 20, 1945; C.A. Vol. 39, pg. 1782.

Machining fiberglas—Reinforced plastics—F. E. Allen; Ind. Plastics 1, No. 2, 10-15 (1945); C.A. Vol. 39, pg. 3692.

Phenolic resin-bonded glass fibers—R. W. Auxier (to Westinghouse); U.S. 2,372,048, March 20, 1945; C.A. Vol. 39, pg. 5563.

Melamine-bonded fiberglas laminates—G. A. Albert; Plastics (Chicago) 3, No. 6, 82, 105-8 (1945); C.A. Vol. 40, pg. 3295.

Glass fabric melamine resin laminates—C. J. Straka; Plastics 5, No. 2, 62-6, 68-70, 80-1 (1946); C.A. Vol. 40, pg. 5597.

Melamine-glass cloth laminates-properties & machinability—P. C. Fuller; Product. Eng. 17, No. 2, 142-5 (1946); C.A. Vol. 40, pg. 5954.

Laminated material—L. S. Meyer (to Libbey-Owens-Ford Glass Co.); Can. 439,904, Feb. 25, 1947; C.A. Vol. 41, pg. 4010; Layers of fabric containing some glass fiber and some cellulose fiber is impregnated with a phenol-HCHO binder. The cellulose fibers prevent the sepn. of the glass fibers from the resin and give the product great strength.

Low pressure laminate—J. Delmonte; U.S. 2,419,440, April 22, 1947; C.A. Vol. 41, pg. 4966; Low pressure laminate is made by bonding alternate layers of glass cloth using a mixture of melamine HCHO resin and plaster of paris using HCl as the curing agent.

Reinforced plastic—H. W. Collins (to Owens-Corning Fiberglas Corp.); U.S. 2,428,654, Oct. 7, 1947; C.A. Vol. 42, pg. 414; A plastic laminate consists of layers of reinforced glass fabric and a resin binder. The glass fabric is reinforced by means of parallel strands of glass fiber.

Laminated materials of artificial resin and glass fibers—F. Bollenrath; Kunstoffe Ver Kunstoff-Tech. U. Anwend 36, 73-80 (1946); C.A. Vol. 42, pg. 2469; Woven glass silk and phenolic resin cured in various shapes. Describes mech. properties and some applications.

Effect of simulated service conditions on plastics—W. A. Crouse etc.; Nat'l Advisary Comm. Aeronant Tech. Note No. 1240, 21 pp. (1947); C.A. Vol. 42, pg. 2470; Asbestos-fabric phenolic laminate and glass fabric unsaturated polyester laminate were found to be the most resistant in exposure to various combinations of moisture, heat, and ultraviolet light.

Glass fiber reinforced plastics—E. White etc. (to Owens-Corning Fiberglas Corp.); U.S. 2,446,119, July 27, 1948; C.A. Vol. 42, pg. 7573; A process for treating glass fibers to increase the adhesion between the fibers and the coating materials such as synthetic resins, by coating the fibers with dextrinized starch, heating to a temperature from 200° per ½ to 3 hrs. to about 400° per 2-3 seconds to fix the starch securely to the fiber surface and then coating the fiber with a synthetic resin.

IV. WOOD

Varnish and Paints for the Impregnation of Cloth and Paper—Anon.; Farbe u. Lach, p. 587; C.A. Vol. 21, Part 1, p. 1019; A review of formulas for the mfg. of artificial leather, etc. and the impregnation of sail, tent, paper, etc.

The influence of Plasticization on the Mechanical, & Elastic Properties of Artificial & Natural Plastic Materials—Otto Manfred & Josef Obisst; Kolloid-Z Vol. 42, p. 174; C.A. Vol. 21, Part 2, p. 2991; The elastic properties of resins depend on their condition of oriented molecular aggregation—determined by the plasticizing treatment they receive prior to hardening or setting.

Ornamenting plywood with paper impregnated with synthetic resin—Int'l General Electric Company; Brit. 308,739, March 27, 1928; Marbles and Wood Patterns; C.A. Vol. 24, 4838.

Composite laminated products including wood veneers—H. Piornik; Brit. 353,094, April 28, 1930; C.A. Vol. 27, 5854; Process Patent.

Composite sheet material—A. S. Lewenstein; Brit. 401,391, November 16, 1933; C.A. Vol. 28, 24816; Surfaced plywood-paper or cloth.

Laminated sheet materials—Dynamit-Actien-Gesellschaft vormals Alfred Nobel & Co.; Brit. 488,911, July 15, 1938; C.A. Vol. 33, 285; Webs of fibrous material or fabric are layered with wood veneers and pressed. The webs being so highly impregnated with a synthetic resin that a smooth surface results.

Experiments on the wearing qualities of resin-impregnated laminated products made from wood or fabric—H. Opitz and F. Blasberg; Kunstoffe 29, 321-5 (1939); C.A. Vol. 34, 8105.

Wood-fiber sheets—H. Meyer; Ger. 688,318, Feb. 1, 1940; Wood waste is mixed with a binder and then pressed between sheets of paper sprayed with a resin. The paper is subsequently removed; C.A. Vol. 35, pg. 3818.

Fibrous composition suitable for laminated products—G. E. Wightman & E. Kritzmacher (to Union Carbide & Carbon Corp.); U.S. 2,229,357, Jan. 21; C.A. Vol. 35, pg. 3012.

Plastics from lignin and wood—Geo. H. Tomlinson, II; Pulp & Paper Mag. Canada 42, 91-2, 120; C.A. Vol. 35, pg. 3080.

Light-colored liquo-cellulose fiber suitable for making sheets or boards—H. W. Morgan & B. O. Stewart (to Masonite Corp.); U.S. 2,234,188, March 11; C.A. Vol. 35, pg. 3817; A process of making steam exploded fiber which is light colored using alkali sulfate to impregnate wood chips before exploding with steam, etc.

Gears of compressed-impregnated materials—M. Kraemer; Kunstoffe 31, 85-7 (1941); C.A. Vol. 35, pg. 4870; Discusses gears made with canvas and wood laminates.

Laminated materials—H. Standinger & P. Coppock (to the Distillers Co. Ltd.); Brit. 512,942, Dec. 19, 1939; C.A. Vol. 35, pg. 6028; Wood is impregnated with polystyrene in benzene and subjected to heat and pressure.

Laminated wood structure—A. Lang; Brit. 525,556, Aug. 30, 1940; C.A. Vol. 35, pg. 6702.

Laminating fibrous sheets—E. R. Perry (to Westinghouse Elec. & Mfg. Co.); U.S. 2,275,-989, March 10, 1942; Prepares laminates using usual materials and a sheet having a binder and an infusible material such as sand or sawdust and bonding with heat and pressure in usual manner; C.A. Vol. 36, pg. 4638.

Plastics. Laminated materials—V. E. Yarsley; Times, Trade & Eng. 51, No. 943, 44 (1942); C.A. Vol. 37, pg. 970; New developments in laminated plastics and the use of wood aided by plastics in aircraft construction are discussed.

Industrial materials of compressed-layer construction—H. Burmeister; Chem Zentr. 1942, I. 2201-Physical properties of hard papers, hard textiles, materials compressed in layers, wood pressed with artificial resin, and their applications; C.A. Vol. 37, pg. 3528.

Resin-impregnated compressed wood—Jicwood Ltd. and R. L. J. Farina; Brit. 547,128, Aug. 14, 1942; C.A. Vol. 37, pg. 5520; Wood is

impregnated with an aq. solution of phenol and hexa, the water is removed and the wood pressed with heat and pressure.

Impregnated material—J. Burns, Ltd; Brit. Pat. 549,615, Nov. 30, 1942; C.A. Vol. 38, pg. 820.

Paper base and wood plastics—A. J. Stamm; Pacific Pulp Paper Ind. 18, No. 2, 41-2 45 (1944); C.A. Vol. 38, pg. 2139.

Three new techniques for large moldings—T. S. Carswell; Pacific Plastics Mag. 2, No. 9, 26-7, 39 (1944); Resin pulp molding, low pressure lam. & post forming discussed; C.A. Vol. 38, pg. 6424.

Possible uses of improved woods & wood-base plastics—A. J. Stamm; Wood Products, 50 No. 1, 21-2; C.A. Vol. 39, pg. 1320.

Plastics from wood and for wood improvement—R. V. Nicholls; Paper Trade J. 119, No. 25, 43-6 (1944); C.A. Vol. 39, pg. 2007.

Wood-cloth and wood-paper laminates—John Delmonte; Brit. Plastics, 17, 341-8 (1945); C.A. Vol. 39, pg. 5549; Use of canvas or paper overlays with plywood etc.

Manufacture of Compreg in Germany—R. Richardson and G. M. Kline; Modern Plastics 23, No. 7, 155-9 (1946); C.A. Vol. 40, pg. 2687.

Present and future technical developments in wood and in paper-base plastics and lignoplastics—Am. Matagrin; Papeterie 68, 39-43, 70-73, 106-7, 109-110 (1946) C.A. Vol. 41, pg. 857; A resume.

Effect of sodium hydroxide on "Compreg"—R. Paulson and W. Gilchrist; Plastics Trends 6, No. 2, 5-6 (1946); C.A. Vol. 41, pg. 1132; Effect of varying strength NaOH solutions on birch Compreg made with a water soluble phenolic resin.

The place of wood in the plastics industry—E. B. Huddleston; Australian Plastics 1, No. 2, 38-41 (1947); A survey; C.A. Vol. 41, pg. 6766.

Plastic laminated wood—A. A. Berlin; U.S.-S.R. 67,247, Oct. 31, 1946; C.A. Vol. 42, pg. 5275; Plywood sheets are saturated with a solution of cyanamide, dicyanamide thiourea, melamine, or a mixture of these, cemented with a resin and cured at 160°. Product has high tensile and impact strength etc. and is resistant to penetration by bullets.

IV. PULP AND FIBRE

Electrical Insulation—Gordon E. Wightman; U.S. 1,966,314, April 2, 1935; C.A. Vol. 29, 3423; Laminated material comprising sheets of porous wood fibers bonded with a synthetic resin.

Laminated sheets—John A. Kenny (to Barrett Co.); Can. 354,906, Dec. 4, 1935; C.A. Vol. 30, 1902; A coumarone-indene resin is pptd. on fibrous pulp. The pulp is formed into a sheet, dried and then the sheets are pressed together to form a laminated product.

Compound paper—The Bushing Co. Ltd. and Wm. J. Brown; Brit. 486,534, June 7, 1938; C.A. Vol. 32, 9500; Describes the addition of a ground resin to the pulp during the beating process, making paper therefrom, coating the paper from a varnish of the same type of resin and making a laminate of them under heat and pressure.

The role of fibers in the manufacture of plastics. The manufacture of laminated plastics—V. E. Yarsley; Sissal Rev. & Ind. Fibres Survey 2, 152-4, 191-4 (1938); C.A. Vol. 33, 5939.

Light-colored liquo-cellulose fiber suitable for making sheets or boards—H. W. Morgan & B. O. Stewart (to Masonite Corp.); U.S. 2,234,188, March 11; C.A. Vol. 35, pg. 3817; A process of making steam exploded fiber which is light colored using alkali sulfate to impregnate wood chips before exploding with steam, etc.

Wood-fiber sheets—H. Meyer; Ger. 688,318, Feb. 1, 1940; Wood waste is mixed with a binder and then pressed between sheets of paper sprayed with a resin. The paper is subsequently removed; C.A. Vol. 35, pg. 3818.

Plastic compositions suitable for molding—M. Dodge (to Columbian Rope Co.); U.S. 2,249,888, July 22; C.A. Vol. 35, pg. 7062; Use of any vegetable fibers with a synthetic resin, etc.

Pressed, fibrous resin-impregnated products such as arm rests for automobiles—W. R. Thomson & W. Flood (to Catalin Corp.); U.S. 2,267,316, Dec. 23, 1941; Uses sisal fiber mat and a phenolic resin catalyzed by use of an acid; C.A. Vol. 36, pg. 2652.

Articles such as trays, formed of fibrous materials and synthetic resins—E. Sawyer (to Keyes Fibre Co.); U.S. Pat. 2,274,095, Feb. 24, 1942; C.A. Vol. 36, pg. 3876; A pulp molding application.

Greater tensile strength for plastics is indicated by experiments with unwoven plastic bonded fiber—M. A. Goldman & G. A. Olsen; Textile Research 13, No. 2, 25-32 (1942); C.A. Vol. 37, pg. 971.

Electrical insulation ratings of commercial compressed papers and fibers—G. Pfestorf; Kunstoff-Tech. U. Kunstoffe-Anwend 11, 252-4 (1941); C.A. Vol. 37, pg. 3528.

Molded bobbin heads from sisal fibers and phenolic resins—Milo C. Dodge (to Columbian Rope Co.); U.S. Pat. 2,326,526, Aug. 10; C.A. Vol. 38, pg. 599.

Plastics having a paper base—J. H. Watson & H. E. Anderson; Brit. Pat. 553,560, May 27, 1943; Addition of chopped sisal fibers etc. to increase strength; C.A. Vol. 38, pg. 5335.

Resin impregnated fibrous materials—L. Smidth; U.S. Pat. 2,376,200, May 15, 1945; Urea HCHO resin for above; C.A. Vol. 39, pg. 3694.

Pulps for pulp-reinforced plastics—S. L. Schwartz etc.; Paper Trade J. 121, No. 2, 42-4; C.A. Vol. 39, pg. 3968.

Plastic products—W. L. Rust & D. M. Musser (to Glenn L. Martin Co.); U.S. 2,371,313, March 13, 1945; Plastic of cotton fibers and water soluble resin; C.A. Vol. 39, pg. 4522.

Pulp reinforced plastics—S. L. Schwartz etc.; Pulp Paper Mag. Can. 46, 771-9 (1945); C.A. Vol. 39, pg. 5549.

Laminated material—L. S. Meyer (to Libbey-Owens-Ford Glass Co.); Can. 439,904, Feb. 25, 1947; C.A. Vol. 41, pg. 4010; Layers of fabric containing some glass fiber and some cellulose fiber is impregnated with a phenol-HCHO binder. The cellulose fibers prevent the sepn. of the glass fibers from the resin and give the product great strength.

Laminated plastic article—A. V. Keller (to Thomson's Ltd.); U.S. 2,439,137, April 6, 1948; A laminate having increased thermal cond. is prepared by metal coating the resin-impregnated fibrous mats before molding; C.A. Vol. 42, pg. 6579.

The swelling of reinforced plastics—F. T. Barwell and K. W. Pepper; Trans. Farady Soc. 42B, 275-82; C.A. Vol. 42, pg. 8519; Discusses causes for swelling of laminates, etc.

IV. CLOTH, COTTON

Laminated sheet material containing synthetic resins—Bakel Corp.; Brit. 300,836, February 10, 1928; C.A. Vol. 23, 4090[4]; Paper or cloth impregnated with glycerol-phthalate type resins and the sheets are bonded with a phenolic resin.

Uniting layers of fabrics with synthetic resins or the like—H. Rommler; A.-G. Brit. 318,489, Sept. 3, 1928; Fabric Base Laminates—Decorative phenolic; C.A. Vol. 24, 2310[4].

Articles such as laminated products from cellulose material and synthetic resins—H. C. Rohlfs to General Electric; U.S. 1,866,372, July 5; Alkyd laminate; paper or cloth; C.A. Vol. 26, 4428[1].

The production of (Laminating artificial masses consisting of) linen impregnated with artificial resins—Brandenburge; Kunstoffe 23, 57-61, 1933; Practical suggestions are given for production and use; C.A. Vol. 27, 2317[4].

Laminated fibrous material—R. E. Coleman; Brit. 398,618, Sept. 21, 1933; Paper reinforced with textile (laminate); C.A. Vol. 28, 1484[8].

Composite sheet material—A. S. Lewenstein; Brit. 401,391, November 16, 1933; C.A. Vol. 28, 2481[6]; Surfaced plywood—paper or cloth.

Urea-aldehyde condensation products—Soc. Pour L'Ind. Chim. a Bale; Brit. 413,439, July 19, 1934; C.A. Vol. 29, 252; Water soluble product suitable for impregnating fabrics, paper, etc. among others.

Laminated panel suitable for trimming automobiles, etc.—Herbert J. Woodall (to Woodall Industries, Inc.); U.S. 1,999,384, April 30, 1935; C.A. Vol. 29, 4105.

Laminated material for composite gears—Emile M. d'Aubigne (to Continental Diamond Fibre Co.); U.S. 1,981,782, Nov. 20, 1934; C.A. Vol. 29, 526; Description of helical gears formed with a rim portion of laminated stock, such as canvas together with a resinous compn.

Forming tubes and rods from fibrous material such as paper or cloth and a resinous binder—Gustave E. Landt (to Continental Diamond Fibre Co.); U.S. 2,001,031, May 14, 1935; C.A. Vol. 29, 4486; Various operative details are described.

Laminated paper product containing a synthetic hydrocarbon resin—Carlton Ellis (to Standard Oil Development Co.); U.S. 2,042,-299, May 26, 1936; C.A. Vol. 30, 4954.

Laminated sheets suitable for electrical insulation, etc.—Kurt Ripper; U.S. 2,066,421, Jan. 5, 1937; C.A. Vol. 31, 1119; Describes a laminate of paper, linen, or asbestos, bound together with a thiouren-CH-2-O resin.

Laminated artificial resin materials. Production qualities and uses of hard paper and hard textiles—Fritz Holm; Maschinenban 15, 267-71 (1936); Chem. Zentr. 1936, II, 381; A review; C.A. Vol. 31, 8745.

Synthetic resin articles—The Goldschmidt; A.-G. Brit. 503,580, Apr. 11, 1939; C.A. Vol. 33, 6991; Describes phenolic resin laminates of paper, cardboard, fabrics, etc.

Experimental investigation of Australian-made dielectrics—Arthur W. Martin; Trans. Inst. Engrs., Australia 20, 411-16 (1939); C.A. Vol. 34, 2493; A detailed study of the mechanism of failure of bakelized paper and canvas bushings.

Electrical insulating material—The British Thomson-Houston Co. Ltd., R. I. Hartin & B. B. Tuppen; Brit. 513,687, Oct. 19, 1939; Cotton fabric which has been subjected to an acetylation process is impregnated with a resin and bonded with heat and pressure. C.A. Vol. 35, pg. 2248.

Gears of compressed-impregnated materials—M. Kraemer; Kunstoffe 31, 85-7 (1941); C.A. Vol. 35, pg. 4870; Discusses gears made with canvas and wood laminates.

Reinforced plastic material—Wm. Jones & K. Batchelor; Brit. 542,379, Jan. 7, 1942; Use of a woven fabric having both textile and metal threads; C.A. Vol. 36, pg. 3875.

Loss of Laminated on prolonged beatings—M. Azam; Plastics Trends 2, 7-8 (1942); C.A. Vol. 36, pg. 5283; Data for impact strength of laminates of muslin and glass cloth with phenolic resin for one week at 300°F.

Laminated structures—N. S. DeBruyne; Brit. 544,845, April 30, 1942; C.A. Vol. 36, pg. 7192; Article of a fabric etc. impregnated with a phenolic resin to which a skin consisting of a metallic sheet is secured by mechanical bonding.

Oil absorption tests—M. Dallin; Plastics Trends 2, No. 7, 6 (1942); Laminated paper base phenolic is less absorbent than laminated canvas, etc.; C.A. Vol. 37, pg. 197.

Industrial materials of compressed-layer construction—H. Burmeister; Chem Zentr. 1942, I. 2201—Physical properties of hard papers, hard textiles, materials compressed in layers, wood pressed with artificial resin, and their applications; C.A. Vol. 37, pg. 3528.

Laminated material suitable for electrical insulation, brake and clutch linings etc.—M. T. Harvey (to the Harvel Corp.); U.S. 2,314,701, March 23, 1943; C.A. Vol. 37, pg. 5167; A punching stock is described made from paper or cloth and a resin using phenol and cardanol and HCHO.

Impregnated material—J. Burns, Ltd.; Brit. Pat. 549,615, Nov. 30, 1942; C.A. Vol. 38, pg. 820.

Flameproofing and laminating sheets of fibrous material, such as paper or cotton cloth—F. P. Hemsickerl (to Westinghouse Elec. & Manuf. Co.); U.S. Pat. 2,329,051, Sept. 7; C.A. Vol. 38, pg. 1115.

Ribbed roof structure for laminated artificial material—E. Komenda; U.S. Pat. 2,347,566, April 25, 1944; C.A. Vol. 39, pg. 228.

Cellulose compounds in thermoplastic laminates—C. W. Eurenius & R. H. Heht etc.;

(Hercules Powder Co.); Ind. Eng. Chem. 37, 949-63 (1945); Laminates with various cloths, cellulose acetate etc; C.A. Vol. 40, pg. 239.

Laminated plastics impregnated paper, impregnated fabrics—Frank & Nagel Chem Zentr. 1941, II, 1800; Review of properties & application; C.A. Vol. 39, pg. 5549.

Laminated materials—E. H. G. Sargent; Brit. Patent 563,950, Sept. 6, 1944; C.A. Vol. 40, pg. 3023.

Textile development and its application to laminated plastics— R. A. Bettridge; J. Textile Inst. 37, 226-37 (1946) also 238-46; C.A. Vol. 40, pg. 7696.

Laminating with melamine resins—J. Noble; Plastics (Chicago) 5, No. 6, 46-48-9, 94-5 (1946); C.A. Vol. 41, pg. 2602; Descriptive.

Flameproofing of cotton fillers in plastic laminates—Simon Williams (Fabric Research Labs. Inc., Boston, Mass.); J. Alfers, C. Furgason; Modern Plastics 24, No. 7, 151-3, 190 (1947); C.A. Vol. 41, pg. 2933.

Water-soluble phenolic resins—The Distillers Co. Ltd., J. Morgan & B. Frenkel; Brit. 581,127, Oct. 2, 1946; Use of a soap to help water soluble properties of phenol-HCHO resins for possible use for impregnation of cloth etc. for laminates; C.A. Vol. 41, pg. 3319.

Acetylated cotton as filler for phenolics—E. E. Halls; Plastics (London) 11, 480-6, 541-4 (1947); C.A. Vol. 42, pg. 3615; Laminates from acetylated cotton fabric have lower water absorption than similar cotton fabric laminates.

Treating phenolic sheet—Wm. I. Beach & R. L. Whaun & A. Peterson (to North American Aviation Inc.); U.S. 2,433,643, Dec. 30, 1947; Deals with the process of post-forming cloth-phenolic laminates.

Cotton fabric laminates—R. K. Witt etc. (Johns Hopkins University); Modern Plastics 25, No. 9, 123-5, 184-91 (1948); C.A. Vol. 42, pg. 6578; Comprehensive data on the engineering properties of grade L and C cotton fabric specimens, supplied by laminators are presented.

IV. ASBESTOS

Panels, slabs or blocks formed of laminated fabrics—Symentis Products Ltd. and W. A. Jones; Brit. 350,931, March 7, 1930; C.A. Vol. 27, 576[2]; Manufacturing of asbestos fabric or other phenolic.

Laminated sheets suitable for electrical insulation, etc.—Kurt Ripper; U.S. 2,066,421, Jan. 5, 1937; C.A. Vol. 31, 1119; Describes a laminate of paper, linen or asbestos, bound together with a thiourea formaldehyde resin.

Effect of simulated service conditions on plastics—W. A. Crouse etc.; Nat'l Advisary Comm. Aeronant Tech. Note No. 1240, 21 pp. (1947); C.A. Vol. 42, pg. 2470; Asbestos-fabric phenolic laminate and glass fabric unsaturated polyester laminate were found to be the most resistant in exposure to various combinations of moisture, heat, and ultraviolet light.

Alkyd-vinyl insulation proves its worth—E. L. Schulman (Westinghouse Electric Corporation); Plastics (Chicago) 8 No. 1, 50-1, 58 (1947); C.A. Vol. 42, pg. 3211; A laminate made of asbestos impregnated with an alkyd vinyl resin replaces Mica as insulation for commutator bars. A table compares the phys. & elec. properties of Micarta 8564 insulation with those of Mica.

Articles from presboard material impregnated with synthetic resins—Brit. Thomson-Houston Company; Brit. 329,273, February 11, 1929; (Phenolic resin laminate).

Laminated products suitable for electrical insulation—A. Runyan (to Continental-Diamond Fibre Co.); U.S. 2,224,523, Dec. 10, 1940; C.A. Vol. 35, pg. 2248; Mica flakes and a binder of ethyl cellulose etc.

Reinforced synthetic resin materials—R. Young and S. Rosenfeld; Brit. 518,074, Feb. 16, 1940; C.A. Vol. 35, pg. 7064; Article of plastic substance and a woven fabric containing some textile threads and some steel wire in warp.

Plastics from silk—T. Suzuki & K. Komatu (Japan 134,344), Jan. 25, 1940; C.A. Vol. 35, pg. 7581; Silk is heated and cooled under pressure.

Reinforced plastic material—Wm. Jones & K. Batchelor; Brit. 542,379, Jan. 7, 1942; Use of a woven fabric having both textile and metal threads; C.A. Vol. 36, pg. 3875.

Laminating fibrous sheets—E. R. Perry (to Westinghouse Elec. & Mfg. Co.); U.S. 2,275,-989, March 10, 1942; Prepares laminates using usual materials and a sheet having a binder and an infusible material such as sand or sawdust and bonding with heat and pressure in usual manner; C.A. Vol. 36, pg. 4638.

Laminated structures—N. A. DeBruyne; Brit. 544,878, April 30, 1942; C.A. Vol. 36, pg. 7192; The non-metallic material comprises cellulose acetate and the metallic sheet is stainless steel.

Modified vinyl plastic compositions suitable for use as interlayers in laminated glass—Brock J. Dennison (to Pittsburgh Plate Glass Co.); U.S. 2,322,571, June 22; C.A. Vol. 38, pg. 184.

Composite material for use in the manufacture of furniture and the like—Camille Dreyfus; U.S. 2,325,669, Aug. 3; Cellulose acetate laminated to wood, etc.; C.A. Vol. 38, pg. 437.

Bonded electrical insulating material—M. J. Cradick; Metropolitan Vickers Electrical Co. Ltd.; Brit. Pat. 550,760, Jan. 22, 1943; C.A. Vol. 38, pg. 1587.

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Low-density laminates—C. A. Scogland; Plastics (Chicago) 3, No. 1, 74-6 (1945); Descriptive; C.A. Vol. 39, pg. 3691.

Moldable resin-bonded fiber composition—A. J. Hanley (to Bakelite Corp. & Respro. Inc.); U.S. Pat. 2,378,477, June 19, 1945; Wadding of cotton impregnated with phenolic resins, etc.; C.A. Vol. 39, pg. 3971.

Bagasse resin laminates—T. R. McElhiney; Modern Plastics 23, No. 3, 121-3 (1945); Laminates made from resin made by high pressure digestion of bagasse and reaction with HCHO, physical properties of laminates described; C.A. Vol. 40, pg. 1689.

Laminated structure—R. V. Boyer (to General Electric Co.); U.S. Pat. 2,376,653, May 22, 1945; C.A. Vol. 40, pg. 4256; Enclosing thermosetting resins in porous form between laminated sheets, etc.

Laminated products—W. Walker & Sons, Ltd. J. R. Alexander etc.; Brit. 468,602, April 12, 1945; Laminated leather products using Urea-HCHO resins and curing by immersing in a high boiling inert organic liquid such as fat or wax; C.A. Vol. 41, pg. 4334.

Chemical resistance of laminates—C. J. Straka; Modern Plastics 20, No. 11, 80-4, 136, 138 (1943); C.A. Vol. 37, pg. 5800; Discussion of resistance to sulfuric acid and NaOH of phenolic laminates with various fillers.

Potentialities of paper-base laminates as compared with other laminates—A. J. Stamm; Paper Trade J. 118, No. 21, 39-41 (1944); C.A. Vol. 38, pg. 4341.

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Liquid coating composition containing resins and adopted for use on paper cloth, plywood layers or other materials—R. L. Smith to Carborundum Co.; U.S. Pat. 2,351,716, June 20, 1944; Mixture or suspension of solid grindable resin in a liquid reactive resin and water; C.A. Vol. 38, pg. 5339.

Large molding techniques—T. S. Carswell; Plastics & Resins 3, No. 10, 10-14, 29-31, 36 (1944); Various procedures described, properties of glass cloth laminates, etc.; C.A. Vol. 39, pg. 643.

V TESTING AND PROPERTIES

V. CHEMICAL

Effect of chemicals on phenol resin bonded laminated products—H. E. Riley; Ind. Eng. Chem. 28, 919-22 (1936); C.A. Vol. 30, 6085.

Swelling and shrinking of synthetic resin plastics based on hardenable phenolic resins—W. Rohrs and R. Morhard; Kunstofftech. u. Kunstoffanwend 10, 113-26 (1940); C.A. Vol. 35, pg. 534; Effect of water and oils on gears, bearings etc. made from plastics.

Chemical stability of phenolic plastics—A. D. Sokolov & N. Zarubina; Org. Chem. Ind. (U.S.S.R.) 7, 452-6 (1940); C.A. Vol. 35, pg. 4515; Effect of acids etc. on phenolic laminates.

The action of motor fuels and oils in impregnated papers—W. Paul; Kunstoffe 30, 142-4 (1940); Papers were impregnated with urea resins and phenolic resins; C.A. Vol. 35, pg. 4516.

Resistance of plastics to chemical reagents—G. M. Kline, R. Rinker & H. Meindl; Proc. Am. Soc. Testing Materials 41, 1246-57 & 1258-1260; Includes laminates and many other plastics and gives their resistance to strong and weak acids and alkalies, salt solutions, and organic solvents; C.A. Vol. 36, pg. 2542, 2643.

Acid and alkali resistance of plastics—J. Delmonte; A.S.T.M. Bull. No. 119, 11-15 (1942); Modern Plastics 20, No. 4, 91-4, 146, 148 (1942); C.A. Vol. 37, pg. 970; Includes laminated plastics among others.

Chemical resistance of laminates—C. J. Straka; Modern Plastics 20, No. 11, 80-4, 136, 138, (1943); C.A. Vol. 37, pg. 5800; Discussion of resistance to sulfuric acid and NaOH of phenolic laminates with various fillers.

Oil and water absorption by laminated bushings—Rudolf Nitsche; Kunstoffe 33, 11-14 (1943); C.A. Vol. 38 (1944) pg. 182.

Chemical analysis & structure determination of plastics—W. Esch & R. Nitsche; Chem. Zentr. 1941, II, 1687; C.A. Vol. 39, pg. 4518; Gives a scheme of analysis to determine kind of resins & fillers present.

Chemical resistance of phenolic laminates—W. R. Tyrie (General Electric Co.); Trans. Am. Soc. Mech. Engrs. 69, 795-7 (1947); C.A. Vol. 41, pg. 7812; Eight types of laminates immersed in various chemical solutions.

Effect of sodium hydroxide on "Compreg"—R. Paulson and W. Gilchrist; Plastics Trends 6, No. 2, 5-6 (1946); C.A. Vol. 41, pg. 1132; Effect of varying strength NaOH solutions on birch Compreg made with a water soluble phenolic resin.

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Water absorption of artificial plastic materials—P. Pinten; Kunstoffe 28, 233-5 (1938); C.A. Vol. 33, 3916.

New swelling and impregnation tests with bearings from plastics—P. Beuerlein; Kunstoffe 29, 251-3 (1939); C.A. Vol. 34, 8104.

The ability of (resin-impregnated) hard paper to withstand weathering and changes in temperature—Werner Paul; Kunstoffe 29, 326-9 (1939); C.A. Vol. 34, 8106.

Swelling and shrinking of synthetic resin plastics based on hardenable phenolic resins—W. Rohrs and R. Morhard; Kunstofftech u. Kunstoffanwend 10, 113-26 (1940); C.A. Vol. 35, pg. 534; Effect of water and oils on gears, bearings etc. made from plastics.

Oil and water absorption by laminated bushings—Rudolf Nitsche; Kunstoffe 33, 11-14 (1943); C.A. Vol. 38 (1944) pg. 182.

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Water & abrasion resistance of plastics—Don Massen: Plastics & Resins 4, No. 4, 9-11 (1945); C.A. Vol. 39, pg. 4775.

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Plastics testing in the paper-mill laboratory—J. C. Parsell (J. P. Lewis Co.); Paper Trade J. 126, No. 16, 55-7 (1948); C.A. Vol. 42, pg. 4389; The use of resins for wet-strength coated, impregnated and laminated papers, and their beater and machine addition is discussed.

Effect of stimulated service conditions on plastics—W. A. Crouse etc. Nat'l. Advisary Comm. Aeronant Tech. Note No. 1240, 21 pp. (1947); C.A. Vol. 42, pg. 2470; Asbestos-fabric phenolic laminate and glass fabric unsaturated polyester laminate were found to be the most resistant in exposure to various combinations of moisture, heat, and ultraviolet light.

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The effect of fungi and humidity on plastics—J. Lentritz, Jr. (Bell Labs.); A.S.T.M. Bull. No. 152, 88-90 (1948); C.A. Vol. 42, pg. 6155.

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The swelling of reinforced plastics—F. T. Barwell and K. W. Pepper; Trans. Farady Soc. 42B, 275-82; C.A. Vol. 42, pg. 8519; Discusses causes for swelling of laminates, etc.

V. HEAT AND COLD, INCLUDING BURNING

The effect of heating on the polymerization and properties of phenol condensation products—G. S. Petrov, S. N. Ustinov, and G. S. Krasovskaya; Org. Chem. Ind. (U.S.S.R.) 2, 135-40 (1936) C.A. Vol. 31, 776; Describes effect of heat on the depolymerization of molded and laminated materials.

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Effect of heat on phenolic laminates—S. W. Place; Modern Plastics 18, No. 1, 59-62 (1940); C.A. Vol. 34, 8106.

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The mechanical properties of synthetic materials at low temperatures—K. H. Hauck; Kunstoffe 33, 76 (1943); C.A. Vol. 38, pg. 425.

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Thermal properties of plastics determines limits of application—W. S. Larson; Prod. Eng. 15, 605-7 (1944); C.A. Vol. 38, pg. 6422.

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Differentation between cold flow and shrinkage of laminated phenolic materials. Symposium on Plastics—Feb. 22-3 (1944); J. J. Martin, Am. Soc. Test. Materials; C.A. Vol. 39, pg. 2009-2010.

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Laminated electrical insulating material—K. Mathes (to General Electric Co.); U.S. 2,439,-667, April 13, 1948; C.A. Vol. 42, pg. 5276; The preparation of flame and arc resistant laminates is described.

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Effect of temperature on the service performance of plastics bearings—C. M. V. Meysenburg; Kunstoffe 37, 69-74 (1947); C.A. Vol. 42, pg. 8022; Bushings of fabric-base laminates were used for tests.

V. WEATHERING

The Effects Produced by Aging in Synthetic Resin Molded Products—E. J. Casselman; Trans-Amer. Electro-Chem. Sec. Vol. 44; C.A. Vol. 17, Part 3, p. 3614; The formation of synthetic resins and methods of mfg. of molded products. Impurities and aging of these products are discussed.

Chemical Problems in Insulating Varnishes—H. C. P. Weber; Ind. Eng. Chem. Vol. 17, p. 11; C.A. Vol. 19, Part 1, p. 902; The effect of aging and curing on the dielectric strength of the varnish films is given. Slow drying is required for good strength and insulation.

The ability of (resin-impregnated) hard paper to withstand weathering and changes in temperature—Werner Paul; Kunstoffe 29, 326-9 (1939); C.A. Vol. 34, 8106.

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V. HARDNESS, ABRASION, MAR-RESISTANCE

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Measuring the hardness of pressed artificial resins—S. Erk and W. Holzmuller; Kunstoffe 28, 109-13 (1938); C.A. Vol. 33, 3917.

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Experiments on the wearing qualities of resin-impregnated laminated products made from wood or fabric—H. Opitz and Fr. Blasberg; Kunstoffe 29, 321-5 (1939); C.A. Vol. 34, 8105,

Mar resistance of plastics—L. Boor; Proc. Am. Soc. Testing Materials; Reprint No. 86 (1942); C.A. Vol. 36, pg. 4930; Mar resistance is measured by allowing abrasive to fall against a test surface, the resultant lowering of gloss being evaluated with an optical glossmeter.

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Laminated plastic article—A. V. Keller (to Thomson's Ltd.); U.S. 2,439,137, April 6, 1948; A laminate having increased thermal cond. is prepared by metal coating the resin-impregnated fibrous mats before molding; C.A. Vol. 42, pg. 6579.

V. ANALYTICAL

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Laminated material—V. H. Turkington (Bakelite); Can. 306,935, Dec. 23, 1930; C.A. Vol. 25, 786[7]; Thermosetting laminate suitable for electrical insulation, manufacture and product.

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Alkyd-vinyl insulation proves its worth—E. L. Schulman (Westinghouse Elec. Corp.) Plastics (Chicago) 8, No. 1, 50-1, 58 (1947); C.A. Vol. 42, pg. 3211; A laminate made of asbestos impregnated with an alkyd vinyl resin replaces Mica as insulation for commutator bars. A table compares the phys. & elec. properties of Micarta 8564 insulation with those of Mica.

Effect of weathering or insulation resistance of plastics—L. H. Campbell etc. (Bell Labs.) Am. Soc. Testing Materials Proc. 46, 1465-73; C.A. Vol. 42, pg. 6575.

V. MECHANICAL

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VI MANUFACTURING

VI. PRESSING

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Assembly to prepare laminated sheets of paper or textile fibers—C. A. Upson; U.S. 2,433,965, Jan. 6, 1948; C.A. Vol. 42, pg. 2104; A continuous process is described of impregnating paper or textile webs with a soln. of thermosetting resin, such as "Virisol" and curing the resin in situ.

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VI. IMPREGNATION

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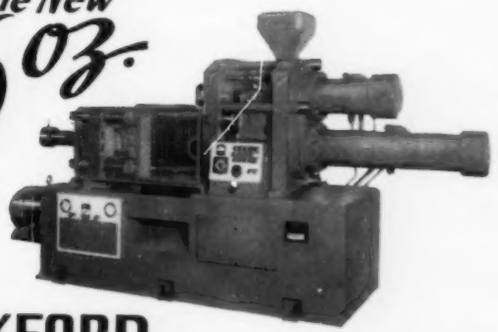

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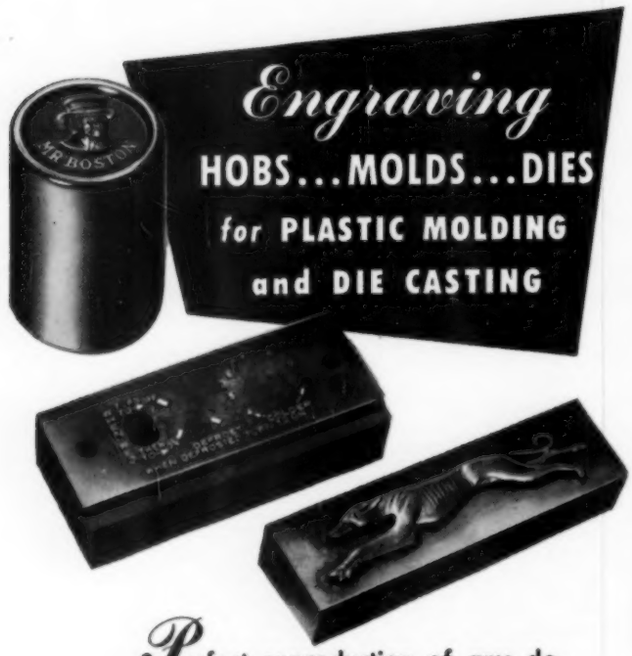

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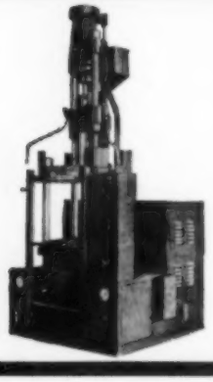

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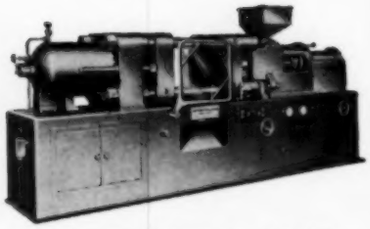

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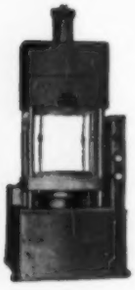

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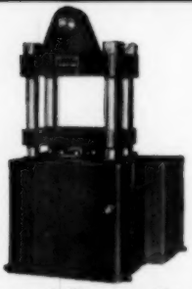

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